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BRIEFLY TOLD.

THE YEAR'S RECORD.—To American gas men the year just closed will in many respects remain sharply impressed on their memories as one worthy of recollection for the teaching that it conveyed. At the close of 1888 the advocates of the general adoption by gas companies of electrical supply were very glib and positive in their assertions about the necessity of entering on such a course. There was no middle ground upon which they were content to rest—it must be "combination," or decay. Well, it seems to us at least, from diligent inquiry and an opinion formed from the revelations of such inquiry, that 1889 has acted as an eye-opener to the enthusiasts (self-dubbed, by-the-way) of the thick-and-thin division. In some places the combined plan has been continued with success, in others it has held its own, while in still other situations failure has been the result. In fact the experience of the past twelve-month in this regard all goes to show that local circumstances and influences are the simple factors that are to determine whether or not it is wise for a gas company to undertake the supply of electric currents. We might go a step further and say that as a rule the teaching of the twelve-month is averse to the operation of the dual system, and that this applies to large, populous and wealthy centers is beyond doubt. However, those who are now considering, or in the future will consider the adoption of the dual plan should be in no haste to reach a decision. The policy of watching and waiting is the safe one.

On the other hand, 1889 has also made plain the fact that gas can and does more than hold its own against all opposition. From output figures received from 42 different points in the country, the total sendout (annual) represented is 2,520 million cubic feet, which quantity compared with that sent out from the same places in 1888, exceeds that of the latter year by a percentage equal to 10.6. In none of the places that figured in this respect did the annual sendout exceed 125 millions cubic feet, and in eight of the places reported on the sendout was less than 30 millions cubic feet. The points chosen were representative ones in different sections of the country, and care was taken to exclude from the inquiry locations which were favored by exceptional growth in population or building development. At 12 of the points noted concessions in rates had been made during the year, and, as usual, in these places the increase in sendout was most marked. As the figures were obtained under the condition that the localities would not be disclosed, no further excuse for the "lump" manner in which they are presented is necessary.

But even if they are given in a general statement their teaching is none the less forceful, when it is attempted through their agency to time the pulse of the gas business in respect not to its rugged permanency alone but also to its bounding rate of progress. We submit that the average (10.6 per cent.) of increase is most gratifying; and that it also is beyond what we hoped it would be we are fain to confess. From the general tenor of the replies to our inquiries we are forced to the conclusion that the progress of the gas business in the present year will be at even a greater pace than that maintained in 1889.

This latter conclusion further takes on a decidedly definite shape from our knowledge that many important changes in the line of betterments and new construction are now being considered by the proprietors of several large plants. These will undoubtedly be ordered this spring,

hence the gas works constructors can share to the full in the satisfaction already the portion of the gas proprietors. From a business point of view, then, the old year leaves no unpleasant memories on its history.

Another important development of the twelvemonth was the approach made in the direction of a clearer understanding of the fuel gas problem. We think we are not far wrong in saying that we are now close to the beginning of the end in this respect, and we believe the thanks of the fraternity are due to Gen. Hickenlooper, Geo. Westinghouse, Jr., and Walton Clark for their utterances on this subject during the year. The General, we think, is entitled to great credit for insisting that the *people* have always had fuel gas at their command in the shape of a good article of illuminating gas—it only remaining for the gas maker to supply it at as economical a rate as possible, that his efforts should be intelligently seconded by the manufacturers of gas apparatus, and that the consumer should supplement the efforts of the others by a careful use of the product and appliances placed at his command. Mr. Westinghouse is to be commended most heartily for his manly acknowledgment that the Hickenlooper theory is the one now worthy of acceptation; and Mr. Clark should share in the approval for the admission that while his researches and those of his confreres although not crowned with success as yet, would nevertheless be continued to the end. To sum it up, the conclusions of the gentlemen mentioned point to the same moral—make intelligent use of that which is before you, for such use is but a spur to the perfecting of old systems and in no wise interferes with the search after that which is new.

The dark drapery to the twelvemonth has been adjusted by the hand of death, and that conqueror of man has made his presence sorely felt. In the death of J. O. King, of Jacksonville, Ills., the fraternity suffered a loss that many a day of time will lapse ere its depth be filled. And in it we are led to remark that the Western Association is the greatest sharer. A shining mark, indeed, did death select when the President of the Western Gas Association was stricken down; but time's merciful hand will in due season reconcile them to their loss, and the memory of his good and useful life will after all live with them and us to the end. Others, who bound the present generation of gas men to those of the olden days, to pass away were Philip Deily, of Philadelphia, F. M. Roots, of Connersville, T. A. Cosgrove, of Evanston, Ills., Jas. Wilbraham, of Philadelphia, A. W. Benson, of Brooklyn—but why enumerate them all again? They were with us and have gone before. That is all.

In conclusion, we have but to remark that, for the fraternity as a whole, the dead year was fruitful of material prosperity, and that the skies of 1890 are bright with good promise.

Mayor Noonan Routs the St. Louis Gas Grabbers.—Following up our reference in the last issue to the infamous gas measure proposed in and indorsed by both branches of the municipal government of St. Louis, it is with great pleasure that we publish the fact that Mayor Noonan has refused to give the infamous proposition his official sanction. Not only so, but in a scathing message puts the conspirators in a proper light before the people. It was a sensible act that does much to blot out many of the "inequalities" of the Noonan administration, and was a peculiarly acceptable gift to the people, who were officially informed of the throttling of the measure on the morning of January 1st.

The Brownsville (Tenn.) Works to be Rebuilt.—Some short time ago the gas works at Brownsville were badly wrecked by explosion and fire, and it was thought by some of the residents that the plant would not be restored. This was not well-founded, however, for Mr. W. B. McKinney, of Troy, O., who owns the plant, has decided to reconstruct the same, and on an enlarged scale. The contracts for the necessary work were awarded about a week ago.

The new telescopic gasholder (capacity 150,000 cubic feet) at the Alameda (Cal.) gas works, is in satisfactory operation.

We regret to have to say that Mr. Ralph Woodward, of the Waltham (Mass.) Gas Company, was recently the victim of a painful accident, that obliged him to remain for some days under treatment in the Waltham Hospital. On the evening of December 24th, while engaged in inspecting a service pipe that ran through a dark and littered cellar, he stumbled over a barrel, a rusty nail which protruded therefrom entering his leg at a point just below and to the side of the knee cap.

We understand that the articles of incorporation, recently filed by Messrs. F. J. Chamberlain, J. H. Smith and W. H. Griffith, at Pueblo, Col., give birth to the Colorado Gas Light and Fuel Company, and that under the certificate the proprietors propose to manufacture water gas in the Colorado counties of Arapahoe, El Paso, Pueblo, Las Animas, Chaffee, Lake and Pitkin. We understand that the first points to be attacked are Denver and Pueblo. There can be no doubt about the aims of the projectors of this movement, who are evidently intent on raiding invested capital.

Obituary.—Arthur W. Benson.—On the 27th of last month, Arthur W. Benson, formerly President of the Brooklyn (N. Y.) Gas Light Company, was stricken by death. As was his life, so was his death. Peaceful and conservative were his habits and manner in the former, in accordance therewith was the latter, the summons reaching him while seated in his boat fishing in the placid waters of Lake Monroe, an indentation of the St. John's river, bordering Enterprise, Florida, where Mr. Benson had been in the habit of evading the rigors of our Northern winter seasons. Deceased was born in Maine, in 1812, removing at an early age, with his parents, to Boston, at which place his education was completed. He finally located in Brooklyn, N. Y., which locality he saw grow from a village of 5,000 inhabitants to its present proportions of a city holding perhaps 800,000 people. He took great pride in improving its condition, and was foremost in urging and assisting that which was calculated to advance its interests. He engaged in the shipping business in New York, and retired therefrom with a competency in 1849, at an age when others as a rule are but beginning to feel safe of their footsteps over the avenues of commerce. About the time that he retired from the shipping business he was elected a member of the Common Council, representing his ward (the First) therein for one term. In the meantime his fortune, by means of wise investment in banking and gas stocks, had largely increased, and many a worthy charity can be traced to his liberal hand. In 1862 Mr. Benson (he had occupied the Vice Presidency of the Company for some years) was chosen President of the Brooklyn Gas Light Company, and remained so until 1882, when he positively declined to be put in re-nomination, or even to allow his name to be balloted for as a director. At this year he withdrew from active participation in business of any sort, but devoted his time to the relief of others. There was perhaps not a better examplar of real, unostentatious charity in the city of Brooklyn, than the late Arthur W. Benson. For instance, it is matter of record, that his salary as President of the Brooklyn Gas Light Company was annually handed over by him to the Treasury of Grace Church, of which he was a vestryman for many years. His careful and intelligent administration of the affairs of the Brooklyn Company were fruitful of great results, and although he may not be well known to the fraternity of to day, time was when Arthur W. Benson's name was a household word in the gas ranks of the East. Liberal, broad-minded, charitable, and blunt, deceased was guided by honor, influenced by charity, and controlled by justice in his dealings with his fellow men. The funeral services were celebrated in Grace Church, Brooklyn, on the morning of December 31st.

The Market for Gas Securities.

The market for city gas shares remained fairly even during the week, despite the fact that money was bid up to 12 and even to 15 per cent. Consolidated holds fairly well the advance scored shortly after the declaration of the dividend, and is to-day (noon, Friday) bid for at 92¼. Perhaps a resume of the course of these shares on the Exchange during the past year may not be without interest. In the period noted the total sales recorded provided for the transfer of 194,406 shares; the opening price for the year was 82; the highest rate recorded was 94½; the lowest was 80½; the last for the year was 91⅞. It is thus seen that the range was 14 points, and that the advance was 9⅝ points. The closing price in 1888 was 82. The increase in the dividend rate, from 4 to 5 per cent., during the year, our readers were prepared for, and while a similar move this year would not surprise us in the least, we nevertheless are inclined to the belief that no such step will be taken. We look, however, to see the shares pass the par mark in 1890. And by way of the gossip that is going we might remark that a few days ago we heard a good authority estimate the value of the Company's real estate at 27½ million dollars.

Equitable shares are firm and higher. This Company is doing a good trade. Brooklyn stocks are about as before. Baltimore Consolidated is active and higher, at 48½. This stock looks to us a purchase. The dividend rate of the Hartford (Conn.) Company has been reduced to 3½ per cent. Cornelius Callahan, an owner of stock to the value of $18,000 in the old Troy Citizens Gas Company, having refused to accept the valuation put upon it by the appraisers who attended to the consolidation of the gas interests of that city, has applied for a commission to revalue the same. J. C. Green, G. W. Greenman and Shepard Tappen have been named as such commission, and they will meet for the purpose indicated on Saturday next. The original valuation was 50 cents on the dollar.

A Page from Experience with an Exhauster.

By Frederic Egner.

Some years ago it was counted a point against the professional character of a gas man if he ventured to express an opinion on any subject connected with the gas business—except, indeed, he did it within the precincts of the Company employing him, and then only to the accredited and constituted authorities, officially, over his particular department. Yet, as the Rev. Mr. Jasper, of Richmond, Va., remarked to his congregation about 12 years ago, "De sun do move, an' I knows it, 'cause de Bible says so;" and I believe we may also say that the world moves, because we see it has done so. And, as evidence of the latter fact, we know that whereas, when silence and secrecy were the peculiar virtues of the gas man, and a yield of 4 cubic feet of poor gas from a pound of good coal, and 4,500 cubic feet of the same gas per retort in 24 hours, was accepted as fairly good average work, that *now*, when we have a number of good associations of gas men, whose members frequently and publicly discus their business and exchange opinions, 5 cubic feet per pound of coal, and 8,000 to 10,000 cubic feet per mouthpiece, is not at all an uncommon result at many gas works. Further, consumers and gas companies have been benefited by the change from the methods of the dark ages to those of progress and light.

Much more could be done if gas men everywhere would consent occasionally to write up items of their experience for publication in the papers devoted to the science of gas lighting. Doing this would not injure anyone, would make no one poorer—not even the giver of the information—and could not fail to result in good to some. If there be some who, on reading these lines, would say to themselves, "If I told all I know others would be as smart as I am," they might reflect upon the truth that if all teachers of man were inspired with such a spirit humanity would never have gone much beyond the instinct of the beast; and it could be that they themselves were most likely benefited by the published knowledge and experience of others. Possibly they still continue to be so benefited, and are perfectly willing that the benefit should yet accrue. Or, if one should be afraid to be considered as a 'fellow who writes too much," let him only remember that it is not how much, but *what* he writes, that will win praise or condemnation. And those who still indiscriminately condemn everyone who, for the good of his kind or for his own pleasure, ventures to speak or write, let them carefully note the indisputable results of the old policy of secrecy and silence, and the outcome of the present more enlightened methods mentioned above.

The following experience with an exhauster is neither in the line of high art nor intricate science; it is only one of those everyday occurrences with some of us which, if they were generally made known, would not unlikely save time, trouble, and expense to others without the least injury to anyone.

A few months ago we bought a Number IV. Roots exhauster, intending to use it in connection with our water gas apparatus. When received the machine was in good order, and could be turned easily by hand, together with the engine, which was on the same bedplate. We commenced operations and everything moved smoothly, that state of affairs continuing for several hours, when, without seeming cause, the exhauster began to work irregularly, and at last stopped entirely. Two men could not pull it around, tugging with all their might at the flywheel of the engine. We were very angry over having a new machine act in that way, and telegraphed to the factory to at once send an expert to determine what was the matter with the apparatus, as we had not time to look it over, and would not bother with it if we had, because a new machine ought not to start out on its mission in such an eccentric manner—so we thought, and said.

The expert made his examination and gave it as his opinion that that exhauster was built for cold coal gas, and, with the latter, it would work all right, for, see (the exhauster had been opened, wiped out, greased, and was cold then), a child could turn it; and with only 20 pounds of steam and a little opening of the valve the exhauster whirled around with the speed of a buzz-saw, apparently. However, as we wanted the machine to pump very hot water gas, the expert placed a few thicknesses of drawing paper between the cylinder heads and the body of the exhauster, to allow for the extra expansion, but stated that he did not think it would work anyhow. What we wanted to get was one of those hot gas blowers, with water-cooled journals. We did not think so, because we were—and had been for years—using a larger Roots exhauster in our coal gas works. That machine was placed next to the hydraulic main, and was pumping very hot gas—as hot nearly as the Number IV. machine was to work on.

We started again. All worked well for over 24 hours, when the exhauster acted as before. This time we did not send for the expert, for we had seen, when the machine was taken apart before, that it was whole and in good order; so we wanted to find out the real cause of the trouble this time, and remedy it if possible. We found it. On removing the pipe plates we found the heads of the exhauster coated with pitch, and the rollers or pistons were similarly affected. That was the trouble. The machine was well made; it was a close, neat fit everywhere. The thin coating of hard pitch on every portion of the inside of the machine had stopped it as effectively as a number of steel wedges could have done it.

But where did the pitch come from? The oil used in gas making contained none, as we could easily prove by evaporating a quantity of it. The coke used contained none; so where did we get it? Well, here it is. We had used as a lubricant of the exhauster some best, pure, natural, W. Va. 29° lubricating oil. In our coal gas exhauster we use no lubricant at all except on the journals, as the tar coming over with the gas makes this unnecessary; but we had no tar in our water gas, and therefore oiled the cylinder of the machine, through the oil cups on top of it, with the kind of oil mentioned. And that it was which caused the trouble, and in this way: The oil used was, as has been said, a good article of petroleum lubricating oil, which we have used with entire satisfaction on all kinds of engine journals and shafting, and also in a large Roots exhauster at our district station, 3½ miles distant from the works, where we pump, daily, cold gas. But our water gas exhauster had to pump very hot gas, and this gas in its passage picked up all of the lubricating oil except the very heavy portions of it, which were left in the shape of pitch, and this accumulated so slowly and evenly that it was bound to stop the machine at last.

Finding the cause, the remedy was quite simple. We removed the slips of drawing paper, which the expert had put in as previously stated. We cleaned out the machine thoroughly by sweeping, and washing with turpentine; and when we started again we used lard oil as the lubricant, and had no further trouble.

To make very sure of the cause of the exhauster acting as it did, we again tried the "pure, natural, lubricating oil," watching the machine very closely though. In two hours it began to act stiff, and we poured turpentine mixed with a little lard oil into it, whereupon the trouble grew less at once, until it ceased entirely. We continued to oil the machine with lard oil, using it quite sparingly. We have had no trouble with the exhauster since, and, notwithstanding the expert's opinion that it was a cold coal gas exhauster, and would not do for the hot water gas, it has done it, and is doing it right along as nicely as anyone could desire, thus proving that the exhauster was all right in the first place, and showing a cause for defective action which many would not have suspected. But as the remedy is given, and is simple and easy of application, we can now bring this paper to a close, with, it is hoped, satisfaction to the reader as well as to the writer.

Proposed Legislation in the Matter of Electric Wiring in Boston Buildings.

The following report has been made by a sub-committee of "representative citizens," of Boston, Mass., that was formed shortly after the recent disastrous fire in that city. This sub-committee, the report from whom is here appended, was appointed to formulate rules for the proper installation of electric wires in buildings, and the findings handed in are:

Your committee appointed to report upon "Electric Wires Inside of Buildings," would recommend the enactment of laws substantially as follows:

For arc light and power wires, or others designed to carry current of over 250 volts electromotive force.

That they shall not be placed so as to be concealed from view.

That they shall not be allowed in contact with wood or other inflammable building material that may become carbonized, but that they shall be separated from such material by at least ½-inch air space by use of non-combustible, non-carbonizable insulators, placed near enough to prevent contact of the wires by sagging or otherwise, but not further than 6 feet apart.

That with such construction wires of opposite polarity shall not approach each other nearer than 10 inches, except at the lamp and switch.

If the wires are incased in insulating tubing that is impervious to moisture, will not support combustion, and of sufficient mechanical strength to protect them from injury, the tubes may be laid as near as 3 inches to each other, and may be fastened to any building material by use of staples or such other means as will not injure the tubing.

All such wires must enter and leave the building at the same place in

order that a non-combustible hand-switch may be placed outside for the use of shutting off the current.

All insulating covering that will support combustion will not be allowed.

For incandescent light and power wires or others designed to carry currents of less than 250 volts electromotive force.

If such wires are concealed within partitions or like places they must not be allowed in contact with wood or other inflammable building material that may become carbonized, nor with any conducting material such as piping or other wires.

They must be rigidly separated from such material by at least ½-inch air space by the use of non-combustible, non-carbonizable insulators placed at intervals near enough to prevent contact by sagging of the wires or otherwise.

The wires must be kept at least 6 inches apart, except where they enter junction boxes, cut outs or the like.

Wires laid in plaster, cement or other similar building material will not be allowed, no matter what insulating covering may be used.

In lieu of construction by air space and non-combustible insulators, wires may be incased in insulating tubing that is impervious to moisture, will not support combustion, and of sufficient mechanical strength to protect them from injury, and such tubes may be laid side by side in plaster, cement or similar finish, or in any concealed space where they will not be subjected to injury, and may be supported by staples, or such other means as shall not injure the tubing.

No switch or safety cut out except those made of non-combustible material will be allowed.

For telegraph, telephone, messenger service and all other electric wires not heretofore mentioned, except public fire alarm and police wires and "series" electric light wires.

All such wires in any town or city in this Commonwealth where electric lights or power wires are being operated, must be provided at the entrance of any building (both ingoing and outgoing wires) with some safety device that shall instantly open the circuit or shunt the current out of the building in case the flow of current shall at any time exceed in quantity or electromotive force that which is normally used on such wires.

Such safety device must be located as near as possible to the place where the wires enter the building, and in some place easy of access.

When the safety device is placed inside of the building, the wire connecting it with the outside wire must be of equal or greater carrying capacity.

The device must be mounted on non combustible material.

All switches, cut-outs, insulators, insulation or tubing for use in electric lighting or power work, and all safety devices herein referred to must be approved by the committee or inspector in power before being used.

Prindle's Retort Lid.

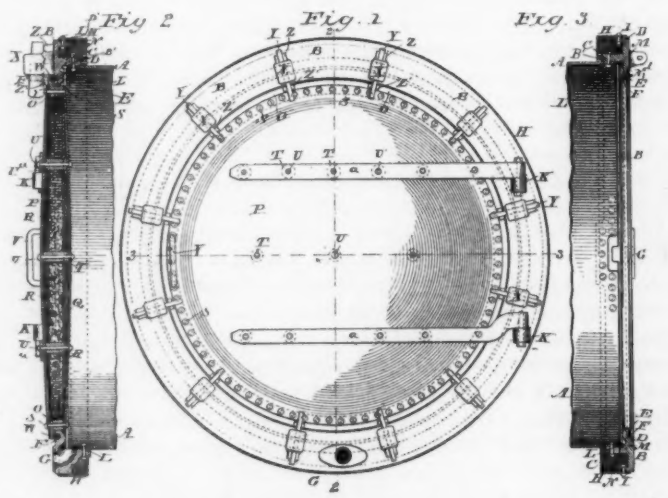
On December 10, U. S. Letters Patent (No. 416,855) were granted to F. C. Prindle (of Wilmington, N. C.) for an improvement in retort lids. In the language of the specification the Prindle improvements relate to cylindrical retorts which are provided with doors for admitting raw material and for removing the residual products after heat has been applied to the retorts—as, for example, for the destructive distillation of wood. But the improvements may be applied to hollow cylinders of any sort.

In the accompanying drawings, Fig. 1 is an end elevation of a retort provided with a circular hinged door, and annular parts around its margin corresponding in function and relation to a common door jamb. Fig. 2 is a section on the line 2 2 of Fig. 1. Fig. 3 is a section on the line 3 3 of Fig. 1. Fig. 4 shows an annular end casting to which in practice the door is hinged. Fig. 5 shows an annular casting which constitutes the frame of the improved door. Fig. 6 shows a sheet metal ring to be secured in practice around the periphery of the annular end casting shown in Fig. 4.

Referring to the letters, *A* indicates a section of a hollow, sheet metal cylinder suitable for a retort; *B* an annular end casting having a cylindrical part *B'*, adapted to be secured to the end of the retort cylinder by means of bolts and rivets *C*, for example, passing through the part *B'*, or in any other suitable way. This annular end casting is formed with an inward annular projection *D*, provided with an annular packing socket *E*, for the purpose of receiving a packing ring *F*, which may be of asbestos or any other suitable material. It is also formed with an outward annular projection *D'* adapted to support the end of a retort. It is also formed with an opening or passage (indicated at *G*, and in practice located in the lower part of the casting), for the purpose of drawing off any residual liquid products that may be contained in the retort. This passage may have applied to it any suitable cock for this purpose.

H indicates a sheet metal ring, which is bolted, as at *I*, or otherwise suitably secured to the outward projection *D'* of the end casting *B*, and serves to rest the retort upon the masonry, so as to leave an air space between the retort and the masonry to facilitate cooling and to prevent overheating the retort in use and injuring it.

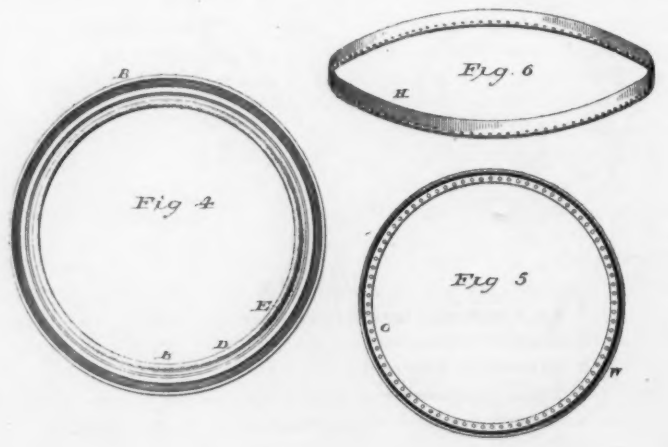
K indicates suitable hinge-pivot projections of ordinary character, properly placed or formed upon the outer face of the end casting. The



end of the retort cylinder at *L* is preferably cut away so as to incline, as illustrated. A shoulder *M* is formed upon the inner part of the end casting *B*, inclining in an opposite direction to the incline of the end of the retort just mentioned. The object of this structure is to form a dovetail annular pocket for receiving packing *N*, which extends in practice all around the end of the retort and secures a gas-tight joint between it and the end casting.

O indicates an annular casting suitable to form a frame for the retort door and adapted to fit within the end casting *B*. The door is composed of this end casting and an outer sheet metal plate *P* and an inner sheet metal plate *Q* and suitable filling *R* between the two of a character to prevent rapid conduction and radiation of heat from the interior of the retort out to the open air.

Asbestos or some composition of asbestos may be used if desired; but any other substance preferred may also be employed. These inner and



outer door plates consist of concavo-convex metallic discs with their concave faces toward each other and adapted to fit the annular casting *O*, to which they are bolted—as, for example, by means of bolts *S*.

T indicates stay-pieces through which the bolts *U* pass to preserve the contour of the door plates which gives great strength to the door. Any suitable packing may, of course, be used, if desired, between the margins of the plates and the annular casting *O* to make gas-tight joints; but no such packing is illustrated, because it forms no part of the invention and is generally not necessary where the metal work is properly done.

V indicates a handle for the door.

W indicates an outward annular projection from the casting *O* hav-

ing an annular flange *W'*, adapted to fit into the annular socket *E* of the casting *B* and bear upon the packing ring *F* to make a gas-tight joint.

X indicates a series of projections from the end casting *B*, provided with wedge-holes to receive the wedges *Y*. These wedges bear at one end upon stumps *Z* on the end casting *B* and at the other upon stumps *Z'* upon the annular casting *O*, and serve to hold the door in place when closed, as is usual.

a indicates the door hinges, of usual construction.

By the instrumentalities described one is able to form end supports and closers for retorts provided with hinged doors, which are cheap, durable, gas-tight and convenient to use, and that will conserve the heat of retort ends, so as to render the interior of a long retort more uniform in temperature than is usually practicable. By this means he dispenses with clay lutings.

The Close Gas Manufacturing Apparatus.

U. S. Letters Patent (No. 416,825) were granted on December 10th to Mr. Thomas J. Close, of Philadelphia, Pa., who made an assignment of his invention to the Gas Improvement Company, of North America. In his specification the inventor says:

My invention relates to apparatus for the manufacture of gas; and it consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings, which form a part thereof.

More particularly my invention relates to externally heated generating

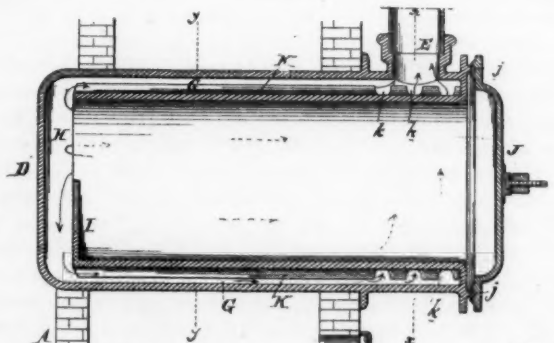
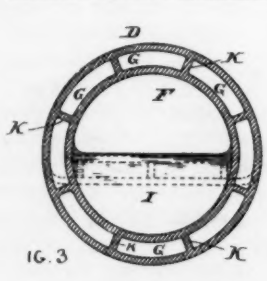


FIG. 1



IG. 3

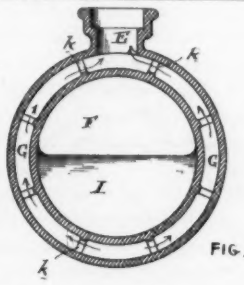


FIG. 2

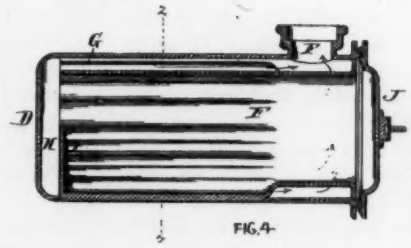


FIG. 4

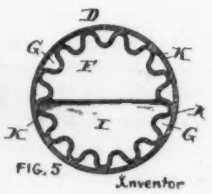


FIG. 5

Inventor

and superheating gas retorts for the purpose of generating and immediately superheating and thoroughly fixing the gas before it passes to the holders, whereby the purity, quantity and illuminating power of the gas is increased.

In carrying out my invention I employ a retort having an inner compartment to contain the gas producing materials, open at both ends, and a superheating space or spaces between the surface of the outer shell of the retort and the inner compartment, a charging door to the inner compartment, and an outlet from the superheating space or spaces to convey the gas to the holder, as more clearly described hereinafter. The products of combustion from this inner compartment pass through the open end thereof into the superheating space or spaces between the outer shell of the retort and the inner compartment or chamber, and are thereby subjected to a large degree of heat, and are superheated and freed of their smoky constituents and made into a thoroughly fixed, pure gas, which escapes to the holder. This inner superheating space between the inner combustion chamber and the outer shell of the retort preferably extends entirely about the inner chamber, so as to form a space on all sides thereof, in order that the products of combustion passing from the inner chamber into this superheating space may be brought in contact with a large area of heating surface. In order to more thoroughly diffuse or scatter the products of combustion throughout this superheating space, I prefer to provide the superheating space with a series of dividing walls or ribs extending longitudinally.

The particular form or shape of the apparatus and the minor details of construction may be varied, as the essence of my invention lies in the formation of a superheating retort with an inner combustion chamber, and a superheating space or spaces between the outer shell of the retort and the inner combustion chamber, through which the products of combustion are caused to pass from the inner combustion chamber to the gas outlet, for the purpose of subjecting them to a large degree of heat to purify and thoroughly fix the gas, and also to protect the inner compartment from an excessive temperature, and thus induce perfect destructive distillation of the products without excessive disintegration and too rapid carbonization of the gas producing materials.

In the drawings, Fig. 1 is a sectional side elevation of the improved retort. Fig. 2 is a cross sectional view of the same upon the line *x x* of Fig. 1. Fig. 3 is a similar view upon the line *y y* of Fig. 1. Fig. 4 is a sectional side elevation illustrating a modification of my invention, and Fig. 5 is a cross sectional view of the same on the line *z z* of Fig. 4.

A is the furnace setting, provided with a grate *B*, above which the generating and superheating retort is supported. *C* is a grate door. *D* is the outer shell of the superheating retort, supported within the setting *A* above the grate *B*. *E* is the gas outlet, opening from the outer shell *D*. *F* is the inner combustion chamber, formed within the outer shell *D* and having a space *G* between the inner surface of the outer shell *D* and the outer surface of the inner chamber *F*. This inner chamber *F* is preferably shorter than the outer shell, and is open at its rear end to the superheating space *G* by a space or passage *H* between its end and the wall of the outer shell *D*, through which products of combustion from the interior of the chamber may escape into the superheating space *G*. This inner chamber *F* is preferably formed with a wall or flange *I* on its rear end to prevent the ashes falling out into the shell *D* and clogging up the lower part of the superheating space *G*. It will thus be seen that the retorts are made long, as compared with their diameter, so as to have as small cubical capacity with relation to the heating surface as is consistent with a proper adaptation to hold the material to be treated.

J is the door of the retort, opening into the inner chamber *F* only, and preferably having an asbestos or other suitable packing *j*, and clamped in place in any manner desired. For the purpose of more perfectly distributing and diffusing the products of combustion throughout the entire superheating space *G*, for the purpose of bringing them into contact with a larger heating area, I prefer to divide the space *G* into channels by a series of longitudinally extending ribs or walls *K K*. These ribs or walls are provided with notches, openings, or holes *k* at the front end to allow the gas to escape to the outlet *E*.

By the arrangement of the ribs the longitudinal passageways are so formed that they communicate with each other at both ends of the retort, receiving the gaseous products at one end and allowing their escape at the other end. The use of these walls or ribs, and the particular formation or construction of them, are not absolutely necessary to my invention, although I consider them an advantage.

In Figs. 4 and 5 is shown a modification of my invention, in which the inner or distillation chamber is formed with a fluted or corrugated surface, with the superheating space *G* formed of the passages made by these longitudinal corrugations. The spaces made by the corrugations open into an annular chamber *g*, communicating with the outlet *E*. In place of making the retort cylindrical, it may be made ⊏-shape, as shown in dotted lines in Fig. 3, or, in fact, of any form which may be deemed advantageous. The ⊏-shaped construction referred to would be found advantageous, as presenting a larger surface of the retort directly to the flame of the fuel on the grate *B*.

The operation of my invention is as follows: The door *J* is opened and a suitable quantity of fuel—such as wood or coal—is placed in the inner combustion chamber *F*. The door *J* is now closed and the heat from the furnace dissociates the fuel in the chamber *F* into its gaseous constituents, which escape out of the rear end of the chamber through the passage *H* into the space *G*. Here they are thoroughly subjected to contact with a large area of heating surface, and their smoky constitu-

ents are fully gasified, and a thoroughly fixed gas of excellent quality is produced, which upon reaching the forward end of the superheating space passes through the outlet *E* to the holder without again entering the entrance or throat of the retort. It is evident that in this form of retort the heat of the outer shell is far in excess of that of the inner shell; hence anything which passes in contact with the said outer wall (through the spaces *G*) is going to be heated to a much higher temperature than that of the chamber *F*. This is utilized to superheat the gaseous products emanating from the inner chamber and convert into gases of the proper composition such carbonaceous vapors and gases not already fully dissociated into the required gaseous products, and such gases are then fixed in passing through the chamber *G'*. By performing the superheating and fixing operation in the same structure, and immediately upon the taking place of the destructive distillation of the gas producing materials (wood or coal), I am enabled to obtain a pure gas of high candle power and great non-condensability. The outer chamber *G* also guards the inner wall of the compartment *F* from becoming too hot, and thus interfering with the proper and perfect carrying on of the destructive distillation process.

It is evident that the retort may be made of metal or fireclay, as desired.

In my improvement the inner chamber *F* is permanently in the retort, and is charged with the material to be gasified through the door or cover *J*. The outlet *E* is not exposed by the opening of the retort, as the shell of the inner chamber seals it at the charging end of the retort.

Mr. Watson Smith on Naphthaline.

The London *Journal*, in commenting on a paper read by this gentleman on Monday week, before the London Section of the Society of Chemical Industry, entitled "Some Notes on Variations in the Products of Different Gas Coals Heated Separately in the same Retort and under Similar Conditions," says considerable attention was devoted to the subject of naphthaline deposits.* Mr. Smith did not appear to be aware that this subject is now interesting to gas engineers in a theoretical sense only, as the causes which lead to its formation are fairly well understood, and also the remedies that are necessary to prevent it; and it seems like going back some 20 or 30 years to find advice given as to the means to be adopted for preventing naphthaline. Briefly, it may be stated that since gas engineers have become alive to the necessity for proper and gradual condensation as distinct from a mere cooling of the gas, they are not troubled with naphthaline to such an extent as to render them anxious to hear of a remedy. With many it has disappeared altogether, and with the remainder an occasional service or main stoppage—usually attributable to the specially exposed position of the pipe in question—represents the sum total of their naphthaline experience. It may then be asked: "If this is so why has the subject of naphthaline any interest at all, even in a theoretical sense?" and the answer is simply that its illuminating value is very high. It is well known that when returned to the gas, in the form of "albo-carbon," a great improvement in the illuminating value is effected. The experiments made by Mr. Leicester Greville showed that 1 pound of naphthaline is equal in illuminating value to 17 pounds of sperm. The view that producers of artificial light should take of the question is not so much an uncompromising removal of such a valuable illuminating constituent from the gas, on account of its inconvenient proclivity to precipitate in the solid form, but a consideration of how it can be retained in the gas and delivered at the burner of the consumer. It is in this light that we approach the consideration of Mr. Smith's paper.

The various hypotheses which are to be found at the commencement may be briefly passed over as the consideration of a chemist rather than those of a practical gas engineer. As to the fact of "air and sun dried coal" receiving a more drastic carbonization than coal "in the usual condition of dampness," we may remark that the percentage of hygroscopic moisture in gas coal as ordinarily carbonized is too low to have any great effect on the temperature of carbonization. Any reduction in temperature sufficient to prevent or materially hinder the formation of naphthaline would also have an effect on the more important result of "make of gas per ton." It is well known that working at high temperatures causes the production of naphthaline; but this is only true within certain limits. With the introduction of generator furnaces the tendency has been to increase the carbonizing temperatures. Higher heats and quicker charges are the order of the day. But no evidence is forthcoming to show that any increased production of naphthaline is observable. The fact that the presence of light hydrocarbons—such as benzene—in the gas is effective in retaining naphthaline and preventing its deposition was observed many years ago, and hence the old-fashioned practice of sweeping out the mains with charges of cannel gas, or of sprinkling the oxide in the purifiers with naphtha.

The likening of naphthaline to snow was a simile adopted by Mr. Lewis Thompson, in a letter to the *Journal*, 33 years ago; and in this connection Mr. Smith seems to have got into some confusion as to the existence of slow currents in the gas mains in summer and stronger ones in winter. The comparatively small consumption during the summer is not so much due to slower currents as to longer hours of daylight. In many districts there is a close agreement between the proportionate consumption of gas and the hours of darkness before 10 P.M. Thus, when there are only two hours (from 8 to 10 P.M.) the consumption will be about one-third of that experienced when there are six hours (from 4 to 10 P.M.). Therefore it does not appear probable that a stream of gas is likely to rush through the pipes at any time during the winter with sufficient force to stir up scales of naphthaline that have laid motionless during the summer. Many gas engineers agree in observing that trouble from naphthaline is experienced at times of changeable atmospheric temperature—such as warm days and cold nights; but we do not find that any have connected them with the velocity of travel in the gas mains. Further, if this theory is correct, the naphthaline should appear in the busiest districts, and at the services of the largest consumers, whereas the exact reverse is the case. The deposits are particularly liable to favor "blind" pipes, lamp services, and other localities where the current is slow. It may be well to observe that some gas engineers use naphthaline as a generic term for deposits of any kind from the gas in the supply pipes. But it frequently happens that the deposit is of a tarry nature, especially where rich gases are supplied, and in cold weather the stoppage may simply be due to freezing of moisture present in the gas.

Mr. Smith has conducted a series of experiments upon seventeen varieties of coal, representing the principal or typical cannels and gas producing coals in the northern coal fields of England. The results were given in a table, and they comprise yield and quality of gas, quantity and strength of liquor, quantity and specific gravity of tar; also percentage of naphthaline and number of gallons of light oil distilling below 180°, and light oil above 180°, per ton of tar. These results are greatly robbed of their interest by the fact that the author is so careful to conceal the names of the coals as not even to state if they are cannels or otherwise. This is, however, perfectly clear from the quality of the gas made. In the majority of cases the make is high—10,200 to nearly 11,000 cubic feet per ton—and the quality rather low—about 14½ or 15 candles. In six instances there is a comparatively small yield of high-quality gas, ranging from 24 to 29 candles. Mr. Smith does not appear to have directed his attention to the quantity of naphthaline present in the gas—a point on which gas engineers are especially desirous of information. The general impression is that the bulk of it does not escape condensation, and that the actual proportion present in the gas as supplied to the consumers is extremely minute. Many chemists have searched for it by means of the usual tests, and failed to find it; and have even been led to suggest that it is formed by synthesis under the conditions which lead to its deposition in the pipes. So we may take Mr. Smith's results as practically indicating the total quantity of naphthaline formed. The only connection to be traced between the proportion of naphthaline and the yield or quality of gas is that the high percentages appear to favor a large make. This may be due to the fact that the percentage of naphthaline agrees remarkably well with the specific gravity of the tar; and a high make of gas is usually accompanied with a yield of thick, heavy tar. The proportion of naphthaline ranges from 2.15 to 6 per cent. In the highest case there is a yield of about 7¼ lbs. per ton of coal, equivalent to more than 120 lbs. of sperm, or somewhere about 25 per cent. of the total illuminating value represented by the yield of the gas. With the cannels this proportion is considerably less, and of course the total sperm value is higher; so that the value represented by the naphthaline is represented by less than one-tenth of the whole. Even at the lower rate, however, it is impossible to avoid an expression of regret that such a valuable illuminant should be allowed to go into the tar well. The general conclusion is that a coal which yields the lightest tar is the least likely to cause trouble with naphthaline. In other words, the coal should furnish a sufficient quantity of light oils to be capable of absorbing or scrubbing the naphthaline out of the gas. If these light oils are reduced from any cause, as by working at an abnormally high temperature, then the naphthaline is less likely to be removed, and therefore more likely to be carried on with the gas. So we are in the anomalous position that a sufficient quantity of one illuminant—viz., light oils, which have been shown by

* See JOURNAL, Dec. 20, 1889, p. 923.

Mr. Liecester Greville to possess an illuminating value nearly equal to that of benzene, or about 12 times that of sperm—should be left in the tar in order to secure the removal of another illuminant—viz., naphthaline. The manufacture of illuminating gas as at present conducted is therefore open to the charge of wastefulness; as it is an unavoidable feature that considerable quantities of illuminating matter must be allowed to pass into the tar well. Mr. Smith's advice, in effect, is either to use a coal that produces a sufficient excess of light oils to render the tar thin, or else to so carbonize it as to secure that result. It sounds more like the advice of a tar distiller than of a gas engineer.

The real question for manufacturers of illuminating gas to consider is not how much naphthaline they produce, but how to secure its complete removal, or better still, how to retain it in the gas. The quality of tar produced does not affect them so long as the tar remains fluid enough to flow off into the tar well. It may contain either 2 or 6 per cent. of naphthaline for all they know—the price received for it will probably be the same. Their point is to secure the highest possible illuminating value in the form of gas; and to prevent annoyance to themselves and their customers on account of stopped pipes. Possibly the circumstances which favor the formation of naphthaline may be just those which yield the best results from their point of view. If the proportion present—be it 2 or 6 per cent.—cannot be retained in the gas without being liable to deposit on the slightest provocation, then the question of means for its removal that will at the same time be thoroughly efficient, and as innocuous as possible in regard to other illuminating constituents, comes into view. Many practical men regard naphthaline in gas as present in the vaporous form, and therefore subject to the laws which influence the carrying of vapors by gases, as continually instanced by water vapor in the atmosphere. There is a "saturation point" beyond which any excess of naphthaline present would be deposited in the solid form; and this point varies according to the conditions of temperature and pressure. Assuming this to be correct, it follows that if the gas is reduced at the works to the lowest temperature to which it is likely to be exposed in the course of its subsequent existence, no further trouble from deposits will be experienced, as any excess of naphthaline present in the gas will be thrown down then and there. This vapor theory is substantiated by the careful experiments of M. Bremond, which do not appear to have attracted Mr. Smith's attention. M. Bremond found that the desiccation of the gas, by passing it through dry lime, was in practice a cure for any tendency to deposit naphthaline. This was explained by the statement that removing one vapor from the gas would leave it more free to retain another.

Mr. Smith's paper comes with singular aptitude immediately after the discussion of the Dinsmore process, at the recent meeting of the Manchester District Institution of Gas Engineers. Mr. Carr shows that it is possible to obtain higher illuminating value from the coal than that which is secured under the usual system of carbonization. Mr. Smith shows that a margin for such increased value exists. We have only to suppose that the conditions obtaining in the Dinsmore duct are favorable to the decomposition of naphthaline, with the formation of lighter hydrocarbons, in order to afford an explanation of the increased value claimed for the Dinsmore process.

It is well known that naphthaline is perfectly stable at the temperatures prevailing in the Dinsmore duct; but that is no reason why it should not be amenable to the influences of other hydrocarbons also present with it. The fact that the production varies in a wide ratio—from one to three, that is very much in excess of other results, such as quantity or quality of gas, or quantity and specific gravity of tar—indicates either that the circumstances which lead to its production are of a narrow character, confined within small limits of temperature; or else that, when formed, it is very liable to decomposition. So it is to be hoped that the further researches on the Dinsmore process, which Mr. Carr indicates as likely to be made, will include an examination of the resulting tar for naphthaline.

Incandescent Lamps on Buoys.

A recent report, made by Captain Millis, of the United States Lighthouse Board, in relation to the electric lighted buoys at the Gedney's Channel entrance to New York Harbor, states that a year's service shows that the system is a practical success. During the last nine months over 220 ocean vessels passed through the channel between senset and sunrise. The buoys withstood the heavy storms of last September without drifting from their positions, and not more than two lamps out of six were extinguished at any one time. On one occasion a buoy was run down by a vessel and entirely submerged without injury. Some trouble has been experienced from moisture getting through the lamp sockets and destroying the connections, but a new form of lamp has been devised which promises to be free from this objection. It has been found that the life of lamps made with red glass globes was much shorter than that of the uncolored ones, an effect which was attributed to the interception of a greater portion of the heat radiated from the carbon filament; and lamps with bulbs of clear glass are now used on all the buoys, lanterns lined with red glass being used to produce the red lights. Captain Millis notes the fact that a building on shore, very near the buoys, was twice struck by lightning while the buoys and their connecting cables were uninjured, and adds: "It is probable that the use of an earth return insures greater safety from damage by lightning than it would obtain if the circuits were entirely insulated."

The Examination of Commercial Glycerine.

Mr. J. H. Wainwright, F.C.S., of the New York branch of the U. S. Laboratory, has prepared the following valuable paper on this subject, which ought to be of great assistance to the gas chemist, if not the gas engineer. He remarks:

The tariff law of 1883 imposes upon "Glycerine, crude, brown or yellow, of the specific gravity of one and twenty-five hundredths or less at a temperature of 60° Fahrenheit, not purified by distilling or refining," a duty of two cents per pound; and upon "glycerine, refined," a duty of five cents per pound.

In view of possible attempts to enter, through the Custom House, a partially refined glycerine as the crude article, a sample of every importation of so-called crude glycerine is submitted to the U. S. Laboratory for examination as to whether it is properly invoiced, or is partially or wholly refined; in the latter case it should pay the higher rate of duty. It has been always considered by the chemists at this port that the extent of "refining" properly permissible in a glycerine in order to bring it within the definition of *crude*, is the allowing of impurities to subside by long standing, or removing them by a process of straining or filtering, and all samples showing evidence of having been treated further than this are reported as *refined* and subjected to the higher rate of duty.

For purposes of classification under the tariff law referred to above, *distillation* has always been regarded as the dividing line between crude and refined, and efforts have therefore been made to determine by means of physical and chemical tests whether this process of refining has been employed, since nearly all the glycerine imported as crude is bought by distillers for the manufacture of glycerine to be used in making dynamite (for which purpose distilled glycerine alone is used) and the white C. P. article used for medicinal and pharmaceutical purposes.

I will now call attention to some of the characteristics of crude and refined glycerine. Glycerine, crude, is defined by the tariff (T. I. new, A. 4) to be "brown or yellow, of the specific gravity of one and twenty-five hundredths, or less, at a temperature of 60° Fahrenheit, not purified by refining or distilling." Crude glycerine is the product obtained directly by stearine candle manufacturers from the saponification or disintegration of their fats and oils, and is a bye-product in the manufacture of soap, being obtained from the waste lyes.

Its specific gravity is usually 1.25, or less, at 60° F., but the gravity of waste lye glycerines sometimes runs much higher, owing to the large amounts of chlorides, etc., present.

Its color is yellow, brown or black, but never white, sometimes light yellow, usually medium to dark yellow and often dark brown or black.

It possesses a strong characteristic odor of fatty acids, usually disagreeable, sometimes even fœtid.

Reaction to litmus paper may be either acid or alkaline, never neutral.

Refined glycerine is usually the product of the distillation of the crude article, the distillation being repeated several times and the resulting glycerine concentrated and further purified by decolorization, etc., according to the uses for which it is intended. Its gravity is usually about 1.25.

Its color ranges all the way from dark brown or even black to white, according to the extent to which the process of distilling or refining has been carried.

If distilled it should have either no odor at all or a more or less burnt odor. This odor in a *distilled* glycerine is highly characteristic and suggests the odor obtained on burning gunpowder. If refined without distillation, as would be shown by other tests, the odor of fatty acids, if any, should be very faint. Distilled glycerine also possesses a characteristic taste faintly suggestive of garlic. This taste, however as well as the burnt odor, is only exhibited in distilled glycerine of inferior quality.

Reaction neutral or very faintly acid.

In determining the nature of a sample of glycerine a problem is often met with, inasmuch as it is often a matter of great doubt whether a sample has been distilled or not. The following tests, however, I regard as extremely reliable, and, with experience and practice, they afford results which admit of very nice distinction between crude and refined (or distilled) glycerine.

A 10 grm. sample is heated in a tarred platinum capsule until it inflames, the source of heat is removed and it is allowed to burn spontaneously; the residue is then weighed and its per cent. calculated. Distilled or refined glycerine will yield from 0. to 0.5 per cent. of "carbonaceous residue," rarely more than 0.5 and never as much as 1 per cent. (unless in the case of an otherwise apparently high grade article it has been adulterated, which would be shown by other tests), whereas crude glycerine yields as high as 10 per cent. I have found the per cent. of "carbonaceous residue" as determined by this test to admit of duplication within very narrow limits.

If desired, a determination of the ash may be made by igniting the "carbonaceous residue."

According to Sulman and Berry (Analyst, 11, 12) the determination of the ash will definitely decide whether the glycerine is crude or distilled; this is somewhat of an error, as it does not necessarily follow that a small proportion of ash alone would indicate that the glycerine had been distilled, since a large proportion of the glycerine manufactured is made directly from fats by "saponification" with steam, in which case the impurities would necessarily be organic and would be destroyed in the process of incineration, hence, other tests to show the presence of fatty impurities must be employed.

I have frequently found samples yielding as high as three per cent. of "carbonaceous residue" and less than 0.05 per cent. of ash. The proportion of mineral matter, however, affords a good indication of the character of the sample, since, in refined glycerine, the ash is never higher than 0.2 per cent. and rarely as high as 0.1, whereas, in crude glycerine made from soaps, lyes and other processes of saponification, the ash frequently runs as high as 14 per cent.

If deemed desirable, an examination of the ash may be made; this also will often afford an indication of the source of manufacture from which the glycerine was obtained (Allen's Com. Org. Anal., 2d ed., 2, 297). Of all the other tests which are recommended for the examination of glycerine the two most important are those made with solutions of silver nitrate and basic lead acetate in distilled water, the former being a two per cent. solution and the latter being made by adding 10 grams. of C.P. lead acetate and 8 grammes of litharge to 500 c. c. distilled water, boiling for some time and filtering. The tests are made as follows:

The silver nitrate test.—Dissolve 5 c. c. of the sample to 20 c. c. distilled water in a large test tube and add 5 c. c. silver solution, shake, allow to stand at rest for one hour. In refined glycerine a darkening of the solution may occur, with even a slight reduction of silver, after standing some time; it will be quite heavy if allowed to stand long enough, even in highly refined samples, but if it is not quite heavy at the end of one hour the result may safely be considered an indication of refined glycerine. In crude glycerine a considerable precipitation takes place, usually at once, and is nearly always *flocculent*. The precipitate may be of any color from black to white, according to the nature of the impurities present.

The lead test.—This test is made by adding to the lead solution in a large test tube, its own volume of a solution containing equal volumes of the sample and distilled water, and shaking and allowing to stand at rest for one hour, as in the silver test. Refined glycerine will remain unchanged or will show a slight precipitation or cloudiness, but never a *flocculent* precipitate, even on standing for a long time, whilst in crude glycerine there will always be more or less of a flocculent precipitate.

In applying these tests it is *never* safe to rely on either of them *alone*, as it will frequently happen that a sample will be met with which will stand one test and not the other; however, if it will not stand both of these tests it is perfectly safe to call it crude, and, with some experience, a fair idea of the value of the sample may be obtained. By boiling, the tests may be greatly hastened, although this is not recommended except in extremely doubtful cases, as the test thereby becomes much more delicate.

If deemed desirable other tests may be made, and among them the following will be found useful.

The addition of an equal volume of distilled water. Refined glycerine will remain clear. In crude glycerine if much oil or fat be present they may be separated from the glycerine in this manner:

Ammonia.—Refined, no change; *crude*, precipitate indicates presence of *iron* and *alumina*.

Ammonium Oxalate.—Refined, no change; *crude*, precipitate indicates *lime* salts.

Barium Chloride.—Refined, no change; *crude*, precipitate indicates *sulphates*.

Nitrogen Peroxide (Gas).—Refined, no change; *crude*, curdling indicates *fatty impurities*

Fehling's Solution.—Refined, no change; *crude*, shows the presence of *glucose*, etc.

For other tests recommended for the examination I would refer to the very able paper of Messrs. Sulman and Berry (Analyst, 11, 12 and 34), and to Allen's Com. Org. Anal. (2d ed., vol 2, 292 et seq.).

With a fair amount of experience a discrimination between crude or raw and refined or distilled glycerine will readily be accomplished by means of the foregoing tests, and, moreover, a fair idea as to the quality of the sample may be obtained, and it may be ascertained beyond a doubt whether it is fit for the manufacture of nitro-glycerine for which so much of the refined glycerine of commerce is used.

Steam Jackets, Their Mode of Action, and the Reasons of Their Economy.

Prof. Dwelshauvers Dery, of Liege University, writing in *Engineering*, says:

In the second volume of M. Hirn's book on the "Mechanical Theory of Heat" (Paris, 1876), the author devotes the first pages to the study, based on actual experiments, of the action of steam jackets. He compares two experiments made under practically the same conditions, with this single difference, that the steam jacket was not at work in the first, but was used in the second. It will, we think, be of practical utility to engineers, if we endeavor to give a brief summary of his analysis and conclusions.

Firstly, we give in the following Table the results of experiments in fractions of the total heat brought by the steam into the cylinder:

	Fractions of Total Heat brought by Steam into Cylinder.	
	Without Steam Jacket.	With Steam Jacket.
Heat given to the walls by partial condensation during the admission of steam—called .....(R_a)	0.459	0.380
Heat returned from the walls to the steam during expansion .....(R_d)	0.173	0.317
Heat passing from the walls to the condenser by evaporation during exhaust..... .....(R_e)	0.273	0.050
Heat lost by external radiation.....(E)	0.013	0.013
Heat furnished to the steam from the jacket.....	....	0.022
Heat equivalent to external work performed during expansion.....(T_d)	0.088	0.113

The heat given up to the walls by the steam during admission is afterwards (1) utilized during expansion to increase the external work; (2) wasted during exhaust in evaporating the water remaining in the cylinder, and sending it on to the condenser; (3) wasted in heating the surrounding atmosphere. We get therefore:

$$0.459 = 0.173 + 0.273 + 0.013$$
$$0.380 = 0.317 + 0.050 + 0.013$$

We see from this Table, first, that the jacket considerably diminishes the initial condensation, that is the heat given up by the steam to the walls during admission, since this is represented by 0.459 without the jacket, and only by 0.380 with it; secondly, the jacket increases the external work during expansion, the heat equivalent to this work being 0.088 without the jacket, and 0.113 with the jacket, in other words an increase of 28.4 per cent. If this increase is expressed as a fraction of the total heat expended, it will be 0.025.

Hitherto the action of the jacket has been considered merely as transmitting to the steam working in the cylinder a quantity of heat represented by 0.022. Even this small amount of heat has produced very great results. But the influence of the jacket does not stop there. We find that it actually reverses the proportions of the gains and losses of the heat stored up in the metal during admission. To prove this, let us compare the heat utilized during expansion and the heat lost during exhaust with the heat due to initial condensation, taking the latter as the unit of heat. We find the following figures:

$$\frac{0.173}{0.459} = 0.378 \qquad \frac{0.317}{0.380} = 0.834$$

$$\frac{0.273}{0.059} = 0.596 \qquad \frac{0.050}{0.380} = 0.132$$

	Without Steam Jacket.	With Steam Jacket.
Heat usefully employed during expansion.	0.378	0.834
Heat lost from the walls during exhaust by the cold condenser.....	0.596	0.132

Thus, without the jacket the heat stored up in the metal walls during admission can only benefit the work of expansion to the extent of 0.378. With the jacket the gain is 0.834. Without the jacket the loss in heat passing unutilized into the condenser is 0.596, while with the jacket this loss is reduced to 0.132. Here are the facts; we will now sum them up in a few words.

The steam jacket has transmitted 0.022 of heat through the metal walls, and this heat has been completely absorbed and utilized during expansion. But its action does not stop there. It has diminished the quantity of heat given up by the steam to the metal during admission by $0.459 - 0.380 = 0.079$; and as a consequence the wasteful cooling of the metal during exhaust has decreased by $0.273 - 0.050 = 0.223$, and the profitable cooling of the metal during expansion has increased by $0.317 - 0.173 = 0.144$. The physical explanation of these phenomena is given by M. Hirn, and he also adduces other facts no less worthy of attentive consideration. We will try to summarize these as clearly as possible.

The interior wall of a steam cylinder passes through successive phases of high and low temperature, in consequence of its contact with mixed steam and water, the pressure of which varies continually. There is a continual exchange of heat going on between the metal and the steam, sometimes in one direction, sometimes in another. For the fluid in action in the cylinder is not homogeneous; water and steam are not mixed in the same proportions in the center and in the neighborhood of the walls. Of course the interchange of heat only occurs in the strata in contact with the walls, for heat does not easily penetrate a gaseous body. The process of transformation from a liquid to a gaseous state, or the reverse, which is produced by this exchange of heat, certainly does not take place, because the entire mass has received or lost heat, but only the particles in contact with the walls. If at the same time the whole temperature happens to vary, this is in consequence of a change of pressure, occasioned by partial condensation or evaporation. In short, it is not a propagation of heat from one particle to another through the whole body of steam which is here meant, but a local exchange of heat in a limited portion, produced by direct contact with the walls, which condenses or evaporates the saturated steam or water. The first is always a slow process: the latter, because of the unstable equilibrium of these bodies, is extremely rapid.

During admission the steam in condensing heats the metal walls, and gives up to them R_a thermal units. This heat the metal returns to the steam; firstly, during expansion, R_d; secondly, as wasted heat during exhaust, R_e. If we neglect the external radiation, we have

$$R_a = R_d + R_e.$$

Any method which tends to diminish R_a or to increase R_d at the expense of R_e is economical. The jacket and superheated steam, therefore, both produce a saving. The effect of the action of the jacket is to keep the metal walls at a higher temperature, and thus to diminish R_a; but it also increases R_d by evaporating during expansion the greater part of the water which covers the inner surface of the metal. The result of this is useful, because the residue of water which is lost in evaporation during exhaust is diminished. But the steam in the jacket is far from furnishing all the heat necessary for evaporation. It only acts as an auxiliary to the steam condensed during admission.

The heat given by the jacket to the cylinder during exhaust has, so to speak, no influence, except, perhaps, to shorten the time necessary to evaporate the water adhering to the internal walls of the cylinder at the beginning of exhaust. At this moment there is a certain weight of water in the cylinder, and a certain amount of heat will be required to evaporate it, which will be neither more nor less, whether there is a jacket or not. The water once evaporated, any further heat the metal can transmit through the gaseous body is insignificant.

If the effect of the jacket were to evaporate all the water condensed during admission, just at the moment when this evaporation would be most useful, that is, during expansion, the loss through the influence of the walls would be reduced to external radiation only, that is, to its minimum. And the result would be obtained with very small expenditure of steam in the jacket.

Hitherto we have only spoken of single cylinder engines. Experiments have proved that a radical difference exists between the thermal phenomena presented by a non-jacketted engine, according to whether it has one or two cylinders. In a compound engine the expanding steam is, in fact, almost entirely separated at each stroke of the piston from the steam flowing in from the boiler. Therefore the effect of the walls upon it must also be different. In a single cylinder non-jacketted engine the metal walls give up heat to the steam during expansion, although the quantity of heat surrendered is much less than with a jacket. In a compound engine, on the contray, the walls, even during expansion, absorb heat from the steam and lose it during exhaust.

If the jacket be applied to a single cylinder, it gives little heat, although the effect produced is very great. For the larger part of the heat given up by the walls, and employed in useful work during expansion, is that already imparted by the steam to the metal during admission. In a compound engine, on the other hand, it is the heat given up by the steam in the jacket which increases the work performed during expansion. M. Hirn says: "With such striking differences caused by details of construction apparently almost insignificant, we are led to believe that a given engine, with a single cylinder and without a jacket, probably may, in consequence of some small structural difference, utilize the heat given up to the walls during admission better than some other engine. Far from being impossible, it is in fact quite likely that the proportion between the work of expansion, for instance, and the exhaust cooling may depend partly upon the relation existing between the diameter of a cylinder and the stroke, or the proportion between the total volume of the cylinder to that of the steam during admission."

One more word concerning superheating, which was employed with remarkable economical effect for thirty years by M. Hirn at Logelbach, and which deserves the closer attention of engineers. This is perhaps the most efficacious means of counteracting the injurious effect of the cool walls upon the hotter steam. It is the best way of increasing the work during expansion by diminishing the exhaust cooling and the initial condensation, because the steam thus contains in itself the heat necessary for these different operations. Of course, neither the advantage obtained by employing superheated steam, nor that afforded by the steam jacket, can be exactly represented numerically. Those who have read the foregoing remarks will easily understand that it depends upon the preliminary conditions under which the engine is already working with saturated steam.

The Dinsmore Process.

[Contributed by Mr. Norton H. Humphrys to the London *Journal*.]

The paper on this subject, which was read by Mr. Isaac Carr at the recent meeting of the Manchester District Institution of Gas Engineers, presents several features that are interesting in a theoretical, as well as in a practical sense. The importance of an increased yield to the extent of 10 per cent., with an increase of 20 per cent. or so in quality, is obvious, especially considered in connection with the comparatively simple arrangement that, according to Mr. Carr, is sufficient to secure such results.

The apparatus described in the paper is certainly a great improvement on that originally proposed, and is the more worthy of attentive consideration as being the outcome of experiments on a working scale. If any valuable illuminants are to be extracted from the tar, by exposure of the same to the influence of heat, this can only be done while the tar is in a state of vapor. And therefore it must be more reasonable to deal with the crude gas fresh from the retort, than to condense the tar out of the gas, and subsequently revaporize it. But Mr. Carr runs full tilt against the established practice in gas engineering. The general rule is to insist on the importance of getting the gas away from the retort as soon as possible. Any appliance that assists to this end—such as the exhauster or the anti-dip valve—is usually said to increase both the yield and the quality of the gas. Claims of this nature have been advanced over and over again, and it is a curious fact that Mr. Carr should obtain similar advantages by going to work in an opposite direction. Instead of hurrying his gas away from the high temperature of the retort, he gives it a prolonged contact therewith. An important feature in connection with the subject is that the Dinsmore process appears to be an anti-dip process —*i. e.*, the gas passes straight away from the duct to the foul main, without meeting any equivalent to the ordinary hydraulic seal. It should further be stated that, according to the opinions general amongst gas engineers, the effect of passing crude gas through a hot retort, is simply a depreciation of quality, attended with a deposition of carbon.

The plain description given in the paper enables one readily to calculate the progress of affairs in the empty retort, or duct, as it is called. The production from six retorts passes through it, and a fairly regular

composition is secured by charging the retorts respectively at regular hourly intervals. So we may say that both the quantity and quality of the gases passing through the duct are practically regular from hour to hour. According to Professor Foster's report, the daily make per bench is 32,500 cubic feet; so that the quantity passed per hour is 1,350 cubic eet, or 22.5 cubic feet per minute. This quantity is, speaking roughly, about equal to 1.33 of the capacity of the duct, so we may say that each particle of the gas is exposed to the heat mentioned—a bright cherry red, cooled down at the outlet to a dull red—for about 45 seconds. The effect of this heating, as usually stated, would be an increase in the pro portion of free hydrogen and marsh gas, with a corresponding loss of illuminants. But according to both Mr. Carr's experience and Mr. Foster's report, this does not represent the facts. A sample of pure Dinsmore gas made on November 11, contained, amongst other constituents, 6.76 per cent. of hydrocarbons, 40.34 per cent. of marsh gas, and 43.98 per cent. of hydrogen. A sample of the town gas, made on the same day, contained 4.37 per cent. of hydrocarbons, 33.39 per cent. of marsh gas, and 50.6 per cent. of hydrogen. This town gas consisted of a mixture of one part Dinsmore gas to two of ordinary gas, made by the usual process; and it therefore follows that the "ordinary" gas contained not much more than 3 per cent. of hydrocarbons, about 30 per cent. of marsh gas, and about 54 per cent. of free hydrogen. But the hydrocarbons in the ordinary gas are of a very different character to those in the Dinsmore gas. In the town gas we have a carbon density of about 3.7, and a hydrogen density of 6.3: as compared with 2.9 and 5.8 respectively in the Dinsmore gas. The effect of the lesser carbon density in the hydrocarbons shows itself in a marked manner in the specific gravity of the Dinsmore gas, which ranges from .420 to .440, merely a trifle more than that of the "ordinary" gas. But it must be remembered that the Dinsmore gas is freed from carbonic acid, whilst the town gas contains 2 per cent. of that impurity. Gas of 22-candle power made by the ordinary process is usually found to have a specific gravity of .530 to .550; and no explanation of the comparative lightness of the "Dinsmore" gas is apparent from the analysis. It may be remarked that, according to published analyses, the carbon density in the hydrocarbons rarely exceeds 3; so the illuminants in the Dinsmore gas do not present any special feature in the matter of carbon density, as compared with ordinary gas. The hydrogen density being about twice that of the carbon, indicates a composition corresponding to that of the olefines (C_nH_{2n}); but this result might also be made up by a mixture of paraffines (C_nH_{2n+2}) with acetylene (C_nH_{2n-2}). The extreme lightness of the gas, which is the more noticeable when we observe that it contains 8 per cent. of carbonic oxide—which is a comparatively high proportion—precludes the presence of almost all hydrocarbons other than ethylene, acetylene, and perhaps ethane. Benzene vapor is nearly three times, and naphthaline more than four times as heavy as air.

It is generally supposed that the heavy hydrocarbons in coal gas are principally made up of bodies of the paraffine and olefine series. The hydrocarbons in coal tar are stated to comprise heavier members of these classes—also benzenes, naphthalines, acetylenes, and crotonylenes, or pseudo acetylenes—besides small quantities of several other classes. If we examine the results likely to obtain by passing a mixture of these bodies, largely diluted with hydrogen and marsh gas, through the "ducts" as given in chemical text books, we shall find that—

1. The higher members of the paraffine classes may be decomposed into lower members of the same class, and small proportions of other hydrocarbons, together with a proportion of free hydrogen.
2. The olefines may be decomposed into bodies of the acetylene class and free hydrogen. At a full red heat they may be converted into paraffine, with a separation of carbon in the solid state.
3. Benzenes may be converted into acetylenes with separation of free hydrogen and various secondary products.
4. Naphthalines and acetylenes are not likely to be affected to any practicable extent.

Apart from these reactions, which are all of an analytical or "breaking up" character, there may be some of a synthetical or "building together" character, such as the union of carbon and hydrogen to form acetylene, etc.

It has already been observed that the reactions obtaining in the duct are attended with the formation of hydrocarbons of comparatively low specific gravity—*i. e.*, the lower members of the various hydrocarbon series; and it further appears that they are attended with the deposition of but little solid carbon. It may be suggested whether the temperature of distillation in the Dinsmore bench is not lower than that usually practiced. We are told that the duct, which is situated in the hottest part of the setting, should not exceed 1,800°; and the charges used—2 cwt. in the bottom retort, and 2½ cwt. in the others—are rather light, considering they remain in for six hours. The analysis of the Dinsmore gas is very similar to that which might be expected to obtain from rich gases made by working at moderately low temperatures in the ordinary way, except that under such circumstances the proportion of free hydrogen is usually lower. But there is the circumstance that the yield of gas is increased 10 per cent. or so, which must be borne in mind when making comparisons between the *percentage* of hydrogen and marsh gas present in the Dinsmore, as compared with the ordinary gas. The same bulk of hydrogen—viz., 5,400 cubic feet—that would represent 54 cent. on a make of 10,000 cubic feet of gas per ton, would only represent 49 per cent. on a make of 11,000 feet. This increase of bulk cannot but be due to decomposition of heavy hydrocarbons resulting in the formation of marsh gas and hydrogen. The increase of the former is especially marked, as it amounts (after allowing for the increase in bulk as above noticed) to nearly 15 per cent., or more than enough to account for the larger yield secured by this process.

But the analysis and the illuminating value of the gas, show that while the heat of the duct undoubtedly exercises a negative action, so far as illuminating power is concerned, by decomposing hydrocarbons with the result of increasing the bulk of the gas—a thing that cannot be done without some loss of illuminating value, since the resulting products are certainly of lower value, and indeed may have no lighting power whatever—there are also reactions of a positive character, whereby substances that under ordinary circumstances would be deposited with the tar, are converted into others that are retained in the gas, and are possessed of high illuminating value. The positive reactions are more than sufficient to balance the negative ones; and therefore the net result of the whole is an increased percentage of hydrocarbons, and an increase of illuminating power. This advantage is secured at the expense of some 30 per cent. of the tar; and the increased bulk is much greater than that which might be expected to follow the decomposition of the hydrocarbons that under ordinary circumstances would remain in the gas as such. The greater part of it must be credited to substances that usually remain in the tar.

It is to be hoped that the inquiry undertaken by Professor Foster will be further extended to include a comparison of the heavy hydrocarbons existing in the "Dinsmore" gas, with those obtained in the usual way. Until some further information on this head is available, it is not possible to speculate with any safety as to which of the reactions above named are of most importance, or prevail to the greatest extent. But from the fact that Mr. Carr moderates the heat obtaining in the duct by cooling (if one may use the expression) the back part, it appears that the gases are just exposed to the heat for a sufficient time to ensure their being raised nearly to the maximum temperature obtaining in the duct, but are not allowed any prolonged exposure to this temperature. They are, so to speak, toasted but not allowed to scorch. If this point is not observed, we learn that there is some danger of deterioration in the quality of the gas, together with separation of solid carbon. In the course of conversation with Mr. Carr, I learnt that the same result would follow if the stream of gas through the duct was diminished from any cause—such, for instance, as one or more of the retorts not being in use. Under normal working, the separation of solid carbon is inconsiderable; and therefore it appears that Mr. Carr favors the class of reactions that result in the separation of free hydrogen—such, for example, as that concerned in the formation of acetylene.

Not only does the Dinsmore process practically do away with the hydraulic seal, by relegating it to the subordinate position of a safety bye-pass, but it also deals with another vexed question—viz., that of stopped ascension pipes. A plain ascension pipe, we are told, used as the outlet from the duct, would block up solid in a few hours' time; but the use of a water jacket, into which water runs at the ordinary, and escapes at a boiling temperature, prevents this trouble. The water jacket simply acts as a cooler; and the gas escaping from the duct must certainly receive a rapid reduction in temperature. How this should enable the crude gas to carry off tarry matters, that would be deposited with such rapidity in a warmer pipe as to block it up in a few hours, is one of those obscure points that will perhaps be cleared up when we arrive at a clear understanding as to the cause of stopped ascension-pipes. Even with water jackets of insufficient capacity, Mr. Carr found that the deposition of pitchy matter was greatly accelerated, thus affording further support to the supposition that the tarry deposit is prevented by simply cooling the pipe to a proper degree.

The actions obtained in a Dinsmore duct appear to be similar to those that occur in the superheater of a water gas apparatus of the Lowe type. In the one we have a mixture of hydrogen, marsh gas, and carbonic oxide, carrying a small proportion of illuminants, and loaded with

tarry vapors; and in the other a mixture of hydrogen and carbonic oxide, loaded with heavy hydrocarbonaceous vapors given off by the partial vaporizing and partial gasifying of the petroleum that is admitted at the upper part of the cupola. The fact that the Dinsmore duct converts some 30 per cent. of the tar into permanent gas, gives some ndication of the value of the superheater as a "fixing" agent, especially when it is remembered that the former is empty, whereas the latter is usually packed with firebrick.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

We are in receipt of a very pleasant reminder from Mr. Geo. F. MacMun, Superintendent of the Natick (Mass.) Gas Light Company, that his Company is still in the field, and proposes to remain so, as a dispenser of cheap and good gas. That the hold of that corporation on the goodwill of the residents may be still further tightened, we have only to remark that on the first inst. the proprietors authorized their Superintendent to announce that the gross rate for gas is to rule at $2 per 1,000 cubic feet, prompt payment to secure to the ordinary user a rebate of 10 cents per 1,000, while all those whose monthly consumption amounted to 10,000 cubic feet and over are granted a rebate of 20 cents per M. This means cheap gas for Natick, and also proves that the management of the Company is abreast of the times.

We understand that Mr. W. L. Cosgrove, of Evanston, Ills., has been appointed Secretary of the Atlanta (Ga.) Gas Light Company, which is now being operated by the United Gas Improvement Company. We wish Mr. Cosgrove every possible success in his new field.

We are indebted to an occasional correspondent for the following account of something that happened, on December 24, at Des Moines, Iowa: "Manager E. G. Pratt, of the Capital City Lighting Company, was yesterday afternoon made the recipient of a handsome surprise, the employees presenting him with a gold watch with the initials 'E. G. P.' on the exterior of the case, while the inside cover bore the inscription, 'Presented to Mr. E. G. Pratt, Christmas, 1889, by the employees of the Capital City Gas Light Company, and of the Thomson-Houston Electric Light Company.' The presentation took place in the afternoon. Mr. Pratt, accompanied by Mrs. Pratt, reinforced or flanked by a wagon load of turkeys, had gone to the works of the Company on the east side of town, and after the fowl had been distributed the men did not seem in any hurry to move off. The cause of their loitering was about like this. The assignment of the turkeys having been completed, Mr. M. T. Wright, Secretary of the Company, stepped forward and thanked Mr. Pratt on behalf of the men, and then introduced Mr. Keffer, who he (Secretary Wright) was inclined to believe wished to say a few words to the Manager. Mr. Keffer then spoke as follows: 'Mr. Pratt—I have been delegated by the employees of the several light companies under your management, the most of whom surround you at this time, to address a few words to you, from a business and social standpoint, touching somewhat upon the history of the Companies. The Capital City Gas Light Company was organized and commenced business in this city in 1876, and for the first ten years of its existence was under the management of Mr. W. A. Agard, who as a manager made it one of, if not the most popular, corporations in the city. It was a Company with which the business men of the city were pleased to do business, and every patron of the Company was its friend. In due course of time the Company sold out and became a part of the great system of the United Gas Improvement Company, of Philadelphia, and Mr. Agard, having business interests elsewhere, resigned his position. The home Company, in casting about for a suitable successor to Mr. Agard, made what seems to us a wise selection in choosing you. And you came among us to assume the duties of the position about three years ago. Your whole life had thus far been spent near your boyhood home, and from which you had never ventured very far away. It required, it seems to us, a good deal of nerve for a man who has had the honor to have been born and reared so near to the center of the earth—Boston—to determine to come to what to you must have been in your imagination the wild and woolly West. But possessing a good supply of nerve, which has been shown, and we suppose backed up by a fair salary, you made the venture; and you found the West not wild at all, and I do not think you have yet seen any evidences of wool. Be assured, Mr. Pratt, that we are not trying to pull the wool over your eyes on this occasion. Upon taking charge of affairs it became your duty, first, to set the machine in motion according to the plans of the new Company. This we all know required a great deal of hard study and harder work. You were ably assisted, however, by your former co-laborer, hard worker, and always a gentleman, Mr. W. A. McEwen, our efficient Secretary, to whom we all reluctantly said good-bye only a short time ago. It then became your duty to look out for your charge from a business standpoint, and that you have succeeded admirably in all your undertakings is evident on every hand. When you came to us we had a gas works—a good gas works—and a small arc light plant. To-day, thanks to your efficient management, we have a gas works the peer of any in the Northwest, and an electric plant second to none. Our pipes and lines have been extended in every direction. The reputation and good name of the Company have been kept up to their former high standard, and it is to-day a model institution of its class. We realize that to you must and should be given great credit, too, for the success thus far attained by the Company; and yet is said that 'things don't happen.' When we consider the fact that you commenced this business in an humble position, similar to that now occupied by our friend Mr. Rivers, as a cleaner of lamps, and that step by step you have progressed until coming to your present high place, we are not surprised, for it is only the legitimate outcome of knowing what to do, how to do, and when to do. We come together to-day, Mr. Pratt, from the different departments of this great plant, a great crowd of men, every one of whom earns his bread by the sweat of his brow, and whose dearest action is on the field of labor, your friends, and to give honor to whom honor is due. It has been from time immemorial the custom upon occasions such as this, when employees, recognizing the ability and services of their manager or superintendent, in addition to their congratulations, to leave something of a more enduring character than the words they may speak, and taking advantage of this occasion, on this Cnristmas eve, they have requested me, as one of their number, to present you with this souvenir of the day, something at once useful and beautiful. We ask you to accept it with our best wishes, and expressing the hope that our relations, which have ever been so pleasant in the past, may continue, and that even greater success may attend your efforts in the future, and that you and your estimable wife—without whom your success might not have been—may have a very merry Christmas and a right happy New Year.' To say that Manager Pratt was surprised is to put it very mildly indeed, and he ought to be extremely thankful that no merciless stenographer was on the platform, with clever symbol and unerring pencil, to transcribe his incoherent speech of thanks, which, however, was none the less agreeable to his hearers, even if it lacked somewhat in rythm. The occasion was a most enjoyable one, and Manager Pratt will remember it for many a day."

We regret to announce the death of Mr. A. W. Benson, formerly President of the Brooklyn (N. Y.) Gas Light Company.

The Decatur (Ills.) Gas Company's electric annex seems to be in high favor with the residents of that city. If we mistake not, the Company is under contract to furnish not less than 1,200 incandescent lights, of 16 candle power each.

The Smith Fuel and Illuminating Gas Company has been incorporated in Michigan, with a capital stock of $600,000. The Company proposes to operate under patents granted to Ambrose G. Smith, of Sheboygan, Wis. A part of the scheme is to sell "State rights" for the operation of the Smith type of apparatus; and we would advise those approached under this head to look into this thing pretty closely.

Advices from St. Joseph, Mo., are to the effect that Chas. McGuire, of that city, has applied to the Council for an ordinance to operate a fuel gas works. This ordinance differs from the Crosby application (which, as was reported in the Journal, had been laid on the table by the Council, with the understanding that it would remain there for some time) in that McGuire agrees to furnish light, heat and power from his gas to the City Hall, city prison and fire engine houses, without charge. He also agrees that his Company shall have three miles of mains laid by Aug. 1, 1890, that length to be increased to ten miles within 18 months from the date of the franchise, at which time the gas is to be ready for distribution on a large scale. It is also stipulated that the price to be charged for illuminating gas shall not exceed $1 per 1,000, the rate for a heating gas supply to be 75 cents per 1,000. From our present knowledge of this last application to the Council we believe that it is not made in good faith; further, that St. Joseph can get along very well without McGuire's proposed gas company.

The Springfield (Mass.) Gas Company has over 500 gas stoves on its services, 40 per cent. of which were placed in 1889. We might also note that the cutting off of the public lamps (the public lighting is now

almost entirely performed by means of electricity), which represented a shrinkage of something like 3½ million cubic feet per annum in the send-out, has not diminished the total output for the year. This speaks well for Mr. Hallett's determination to keep in front, and shows that his confidence in establishing a large increase in the Company's day trade was well founded.

It is more than probable that the Louisville (Ky.) Gas Company will make a trial on a fairly large scale of the Gordon burner for street illumination. The send-out of the Company for the year shows a large increase—in fact, we should not be surprised to hear that the maximum send-out (daily) approached closely to 2½ million cubic feet. Engineer Barret's new holder ought to be a source of great consolation (and safety) to him these dark days.

The following figures show the quantities of gas sent out from the Philadelphia works on the dates mentioned—the quantities are in millions of cubic feet:

Year.	Dec. 24.	Dec. 25.	Dec. 26.
1880.....	9,115	7,251	6,416
1881.....	9,746	6,746	7,350
*1882.....	7,496	7,766	9,740
1883.....	11,624	8,436	9,723
1884.....	11,268	8,665	10,205
1885.....	12,674	9,070	10,839
1886.....	13,973	10,524	9,474
1887.....	13,415	9,479	11,075
1888.....	14,454	10,784	12,933
1889.....	13,360	10,094	12,470

The new Company at Duquoin, Ills., is almost ready to supply gas. The public lamps (100 in number) have been placed in position.

Mr. Lynn R. Zimmerman, of Rochester, N. Y., has been appointed receiver of the Medina (N. Y.) Gas Light Company, a receivership having become necessary because of the verdict of damages awarded Wm. Allport, who sued to recover for injuries occasioned by an explosion at the works some months since.

The following notice has been published by the proprietors of the Newton (N. J.) Gas Light Company: "Nearly four years ago the Newton Gas Light Company reduced the price of gas from $4 to $3 per 1,000. We take pleasure in announcing a further reduction—the concession to take effect on all gas consumed from Dec. 1: In quantities of less than 5,000 feet per month, $3 per 1,000; in quantities of 5,000 feet or over per month, $2.50 per 1,000. From these prices a discount of 10 per cent. will be allowed on all bills paid within 30 days, making the net prices $2.70 and $2.25. If the Company meets with sufficient encouragement, it hopes to be able to make a still further reduction in the future." This is the practice that pays.

Some days ago the proprietors of the Somerville (N. J.) Electric Light Company made a proposition to the authorities for the public lighting that was based on very reasonable terms. The Gas Company, however, also submitted a bid that was finally accepted by the Town Commissioners, and a contract executed under it. The rate agreed on was $1.50 per lamp (a total of 70 posts to be maintained) per month, the lighting to be kept up every night and all night. No wonder the Town Commissioners acted as they did.

In the case of H. A. Keyser vs. the Mahanoy City (Pa.) Gas Company, tried at Pottsville in the last week of December, a verdict for $3,000 was awarded the plaintiff. The latter is a hotel keeper, and the basis of his complaint was that his business had been ruined by the offensive odors emanating from defendant's plant. The case will be appealed.

In our last issue we published an account of certain action by the Newport (R. I.) Sanitary Protective Association in respect to the proposed supply of a mixture of coal and water gas by the Newport Gas Light Company. It may be remembered that a portion of that action was the appointment of the President of the Association as a committee to interview the President of the Gas Company on the exact nature of the gas that was to be supplied by the Company. The inquiry was made, and the reply thereto of Mr. Henry Bull, President of the Company, is as follows:

*Sunday.

"Office Newport Gas Lt. Company,
"Newport, Dec. 24, 1889.

"*Dear Sir:* I have your note asking to be informed what percentage of water gas our Company proposes to use as an ingredient of the illuminating gas of this city; and in reply would say. Our primary object in having a water gas plant is to provide additional security against our city being left in the darkness from any serious accident to our works, or from sickness, death or defection of skilled workmen, whose places could not readily be filled. Not that we are specially liable to such contingencies, for our works are second to none of their size in the country, and are provided with every safeguard known in the manufacture and distribution of gas. The additional advantage of a small water gas plant is that it can be fitted up at once to supplement the gas in our holders, on the first indication that the supply is likely to be short. Our secondary object in having a water gas plant is to determine by our own experiments the feasibility of supplying mixed gases, which it is now generally claimed will produce, at the same cost, better light than either kind alone. We are led to do this from the fact that there are now in the United States 367 water gas plants in use, furnishing that gas either as an entirety, or as an ingredient of coal gas, all of which have sprung into use in 14 years. In this State, Woonsocket has put in one recently, aud the city of Providence is now erecting one with a capacity of 800,000 cu. ft. daily. In regard to the relative poisonous influence of the two gases, the opinion now prevails among those best informed on the subject, that there is little or no difference between them in this respect, and that neither is deleterious to the public health except through ignorance or carelessness in their use. From these explanations you will see that I cannot now give you a categorical reply to your questions, but in order to allay all apprehensions which your Society may entertain for the safety of gas consumers, I assure you that under no circumstances will this Company send out any gas whose presence in the atmosphere to the extent of 8 per cent. is rapidly fatal to life through its de oxygenating action on the red blood corpuscles, as well as its specific effect on the central nervous system. I am very truly yours, Henry Bull, President."

The "City Gas Company, Rochester, N. Y.," has been incorporated by James A. Chapman and Ed. T. Rice, Jr., of New York City, and Samuel Walters, of Jersey City, N. J. Its term of life is put at 50 years, and it is capitalized in $500,000. Although the avowed objects of the Company "are to manufacture and sell gas, electricity, and other agents for the production of light, heat and power," it is not at present surmised that the project is intended to compete with the artificial gas company of Rochester. It probably had its inception in the recent howl raised against the natural gas suppliers in upper New York for their increased gas rates, and most likely has to do with the supply of the natural article.

In future the contracts for public lighting by means of arc lamps in Philadelphia are to be based upon the intensity, etc., of the current furnished, instead of on the present estimate of candle power.

It is presumed that this determination arose from the fact that recent tests for candle power made on arc lamps furnished under contract to the city of Philadelphia proved the illuminating value to be greatly under that bargained for by the city. For instance, the Thomson-Houston lamps (2,000-candle power nominal) had an average value of 1,160 candles, the Brush record being 936 candles. The United States Company's lamps (1,000-candle power nominal) yielded but 479 candles.

The Newark (N. J.) Gas Company has declared a quarterly dividend of 2½ per cent.

The Pottstown (Pa.) Gas and Water Company has declared a stock dividend of 25 per cent. The Company will build a new water plant this year.

About a fortnight ago Senator Butler again introduced the bill offered by him at the last session of the United States Senate to incorporate the Equitable Gas Light and Fuel Company of the District of Columbia. The incorporators named are Messrs. Chas L. Mitchell, Jacob Bertschman, W. A. De Long, Harry Keene, C. D. Harrison, Frederick W. Jones aud E. W. Saportas. Capitalized in $2,000,000.

The Newton and Watertown (Mass.) Gas Light Company is engaged in experimenting with an electric system for lighting and extinguishing the public lamps.

The Dover (N. H.) Gas Light Company, having been appointed local agent for the sale of the Welsbach incandescent gas burner, has fitted

up its offices on Portland street with an extensive assortment of the various sizes of the burner noted.

APPLICATION has been made to the Provincial Legislature by certain promoters for a charter for a company to be known as the Montreal Consumers Gas Company. The capital stock is placed at $3,000,000, with power to increase the same to $6,000,000. It is understood that English capitalists are behind the scheme. The charter of the present Montreal Gas Gompany does not expire until 1895, and under its provisions the Company is obliged to make a considerable concession in gas rates, the same to take effect in May of this year.

A SINGULAR accident occurred in the laboratory room of the Lawrence (Mass.) gas works one day last week. Messrs. H. H. Church, of the gas works, C. W. Stevens of the Wright Manufacturing Company, and G. S. Stevens, of the Atlantic Mills, were examining the various chemical apparatus in the laboratory when a bottle containing ammonia burst, the liquid causing severe burns to two of the party.

IT is said that an opposition gas enterprise has been organized for Owego, N. Y., the plant for which is to be located on the site of the old flour mills, in what is known as the Canawanna district. The Company is to be known as the Citizens Gas Company, and its Directors are: Messrs. W. E. Dorwin, W. L. Haskins, C. O. Thompson, E. T. Stone, W. E. Mayor, D. W. Pitcher and Geo. F. Andrews, of Owego, and Geo. F. Lyons and W. G. Phelps, of Binghampton.

THE bids for the lighting of Boston by means of arc lamps have been rejected, and new specifications have been arranged for.

A RECENT issue of the Los Angeles (Cal.) *Tribune* contained the following: "The Los Angeles Lighting Company has purchased the plant of the Lowe Gas Company, and this transfer of property has led to complications likely to be settled in the courts. It is said the new company refuses to recognize the contracts entered into by its predecessor, and claims the right to fix its rates irrespective of any agreement entered into by the Lowe Gas Company. In pursuance of this policy a collector of the Company called on H. J. A. Stuhr, a wholesale liquor dealer on West First street, and presented a bill at the usual rates. This Mr. Stuhr said he did not feel compelled to pay, as by the terms of an unexpired contract with the Lowe Gas Company he has heretofore received a rebate payable in shares of the company. A day or two thereafter a plumber called at Stuhr's warehouse, saying that he had come from the Los Angeles Lighting Company to remove the meter. Stuhr objected to this summary method of settling the dispute and ordered the plumber from the premises. Going at once to the police station the plumber laid the case before the department, and an officer was detailed to protect him from harm. Reinforced by an additional helper from the Company's office the three repaired to Mr. Stuhr's store, No papers nor authority of any kind were shown by the officer, except his star, which Mr. Stuhr said he regarded as scarcely sufficient in the replevin of property or the violation of a contract for lighting his premises. He submitted, however, upon pain of arrest, to the removal of the meter, but will institute suit to determine what right the Company had to act in the manner described."

THE Queen City Electric Light Company, of Dallas, Texas, is engaged on the construction of its central station.

IT is reported that the Board of Trustees of Saratoga Springs, N. Y., have granted a franchise for the operation of an opposition gas and electric light plant in that place. The capital stock of the new concern is put at $100,000, and as the capital of the old Company is $300,000, the Trustees, by their injudicious action, have placed the gas consumers under obligation to pay interest on an additional 33 per cent. of capital investment. Now is the time for cheering over opposition, but the result is sure to furnish a season of howling about consolidation.

SHORTLY before Christmas the Hartford *Daily Times* notified the residents that "Gift No. 5" on its Christmas tree consisted of a box of wax candles, which were intended for the Gas Company, "to help it out on dark nights." Taking the "funny man" at his word, Mr. Harbison visited the *Times* office on Christmas morning and demanded that "Gift No. 5" be given him. He got the candles.

THE water gas plant for the Hutchinson (Kas.) Gas Light and Fuel Oompany will soon be in working order.

GAS was turned into the mains of the new gas works at Aberdeen, South Dakota, on the evening of December 20th. Supt. Gray is to be congratulated on the celerity with which construction work was pushed at this point.

THE rumor is current in Pittsburgh that the Philadelphia (natural gas) Company is shortly to put a new contract schedule in force that will show a large increase over the rates for 1889.

Recent Patent Issues.

The following list of recent patents relating to the gas interests is specially reported by Franklin H. Hough, solicitor of American and foreign patents, 925 F street, N. W., Washington, D. C.

ISSUE OF DECEMBER 3, 1889.

416,520. Gas, Apparatus for Manufacturing of. R. R. Turner, Columbus, O.
416,609. Gas Apparatus, Oil. A. Henning, Oakland, Cal.
416,624. Gas Burner for Incandescent Illumination. A. C. Humphreys, Philadelphia, Pa.
416,649. Gas Engine. C. Sintz, Springfield, O.
416,216. Gas Governor. F. Ellis, San Francisco, Cal.
416,635. Gas Lighting System. A. Lungren, New York, N. Y.

ISSUE OF DECEMBER 10, 1889.

416,776. Apparatus for Mixing Gas and Air. E. B. Denny, Newark, N. J.
416,825. Apparatus for Manufacturing Gas. T. J. Close, Philadelphia, Pa.
416,986. Gas Burner, Coal Oil. L. J. W. Bairn, Chicago, Ills.
417,101. Gas Burner, Safety Attachment. M. Siersdorfer, Louisville, Ky.
416,979. Gas Burner, Safety Attachment. R. P. Williams, Boise City, Idaho.
416,707. Gas Burner, Self-Lighting. E S. Allen, New York, N. Y.
416,753. Gas Furnace, Regenerative. C. M. Ryder, New York, N. Y.
416,722. Gas Governor and Pressure Regulator. N. J. Ryder, Washington, D. C.
416,895. Gas Light Safety Catch. J. D. Bowman, Altoona, Pa.
417,075. Gas Lighter, Electric. N. Newman, Springfield, Ills.
417,198. Gas Lighter, Electric. N. Newman, Springfield, Ills.
417,134, 417,135 and 417,136. Gas Pressure Regulators. H. J. Bell, Gloucester City, N. J.

ISSUE OF DECEMBER 17, 1889.

417,431. Gas, Apparatus for Manufacturing of. J. Schinneller, Pittsburg, Pa.
417,526. Gas Burner, Incandescent. J. L. Stewart, Philadelphia, Pa.
417,471. Gas Engine. W. E. Crist, Brooklyn, N. Y.
417,472. Gas Engine Igniter. W. E. Crist, Brooklyn, N. Y.
417,624. Gas Engines, Operating. J. C. Beckfield, Allegheny, Pa.
417,658. Gas for Heating and Illuminating Purposes, Apparatus for Manufacturing of. B. T. Babbitt, New York, N. Y.

ISSUE OF DECEMBER 24, 1889.

418,016. Gas, Apparatus for Manufacturing Illuminating and Heating. J. Hanlon, New York, N. Y.
418,018. Gas, Apparatus for Manufacturing of. J. Hanlon, New York, N. Y.
418,017. Gas, Apparatus for Manufacturing of Illuminating. J. Hanlon, New York, N. Y.
417,719. Gas Burner, Automatic Safety. N. M. Garland, St. Louis, Mo.
417,765. Gas Burner, Open. G. E. Wright, Birmingham, England.
417,924. Gas Engines, Automatic Ignition in. E. Korting, Hanover, Prussia.

ISSUE OF DECEMBER 31, 1889.

418,270. Gas and Electric Light Fixture Combined. D. J. Braun, Chicago, Ills.
418,550. Apparatus for Manufacture of Gas. M. C. Burt, Lake View, Ills.
418,615. Apparatus for the Manufacture of Gas. J. Hanlon, New York, N. Y.
418,647, 418,648, and 418,649. Apparatus for Manufacture of Gas. P. W. McKensie, New York, N. Y.
418,551. Apparatus for Manufacture of Gas by Electricity. M. C. Burt, Lake View, Ills.
418,417, 418,418, and 418,419. Gas Engine Igniter. L. H. Nash, South Norwalk, Conn.
418,314. Gas Retort Furnace, Regenerative. W. Foulis, Glasgow, Scotland.

THE AMERICAN GAS LIGHT JOURNAL

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MONDAY, JANUARY 6, 1890.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks.

16 WALL ST., NEW YORK CITY.

JANUARY 6.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	92¼	—
Central	500,000	50	—	—
" Scrip	220,000	—	—	—
Equitable	4,000,000	100	122	127
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	116	118
Mutual	3,500,000	100	103	105
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	—	—
Preferred	5,000,000	100	—	—
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	60	70
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	109	110
Citizens	1,200,000	20	68	70
" S. F. Bonds	320,000	1000	100	103
Fulton Municipal	3,000,000	100	122	125
" Bonds	300,000		100	105
Peoples	1,000,000	10	75	77
" Bonds (5's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	1,000,000	100	95	—
Nassau	1,000,000	25	112	—
" Ctfs	700,000	1000	100	—
Williamsburgh	1,000,000	50	118	122
" Bonds	1,000,000	—	108	112
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	—	93
2d " " "	3,000,000	1000	71	72
Bay State Gas Co.—				
Stock	5,000,000	50	24	25
Income Bonds	2,000,000	1000	—	—
Buffalo Mutual, N. Y.	750,000	100	90	95
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
" " Bonds.	45,000	—	—	—
Chicago Gas Trust	25,000,000	100	42½	—
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	90¼x	—
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	97½
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	99
2d "	2,500,000	1000	—	97
Consumers Gas Light Co., Jersey City	2,000,000	100	—	—
Bonds	600,000	1000	—	—
Cincinnati G. & C. Co.	6,000,000	100	214	218
Consumers Toronto	1,000,000	50	190	200
Central, S. F., Cal.			80	90
Capital, Sacramento, Cal			58	
Consolidated, Balt.	11,000,000	100	48½	—
" Bonds	6,400,000		107	107½
Hartford, Conn.	750,000	25	102	108
Jersey City	750,000	20	190	—
Laclede Gas Light Co., St. Louis, Mo.—				
Common Stock	7,500,000	100	19	20
Preferred "	2,500,000	100	—	—
Bonds	9,034,400	1000	85¾	86¾
Louisville, Ky.	2,570,000	50	125	130
Little Falls, N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	200	208
Memphis (Tenn.) Gas	750,000	100	48	51
" Bonds.	240,000	100	103	—
New Haven, Conn.		25	200	—
Oakland, Cal.			35	35½
Peoples, Jersey City		—	60	61
" " Bonds.			—	—
Paterson, N. J.		25	99	102
Rochester, N. Y.		50	99	100
Syracuse, N. Y.	500,000	25	—	—
San Francisco Gas Co.			60	60½
San Francisco, Cal.	10,000,000	100	59¾	60
Washington, D. C.	2,000,000	20	200	208
Wilmington, Del.		50	88	90

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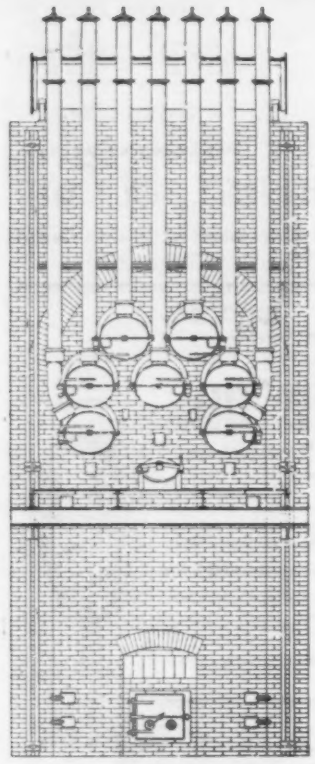

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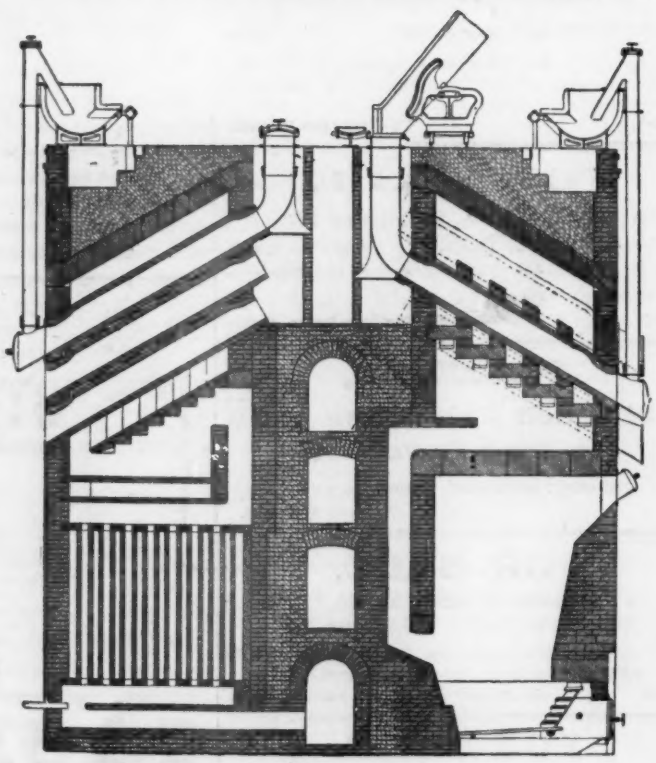

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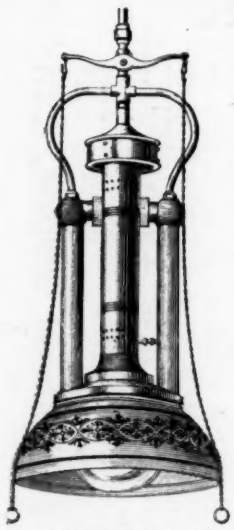

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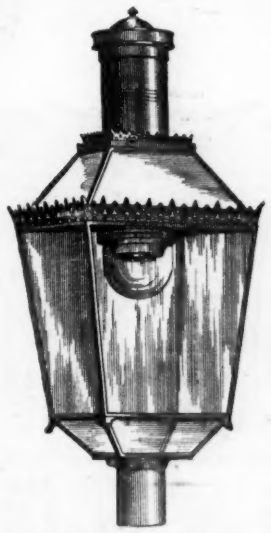

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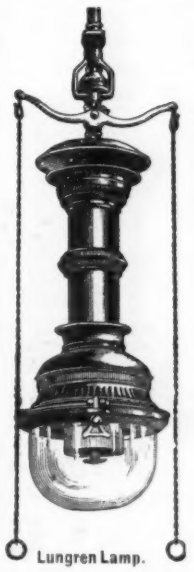

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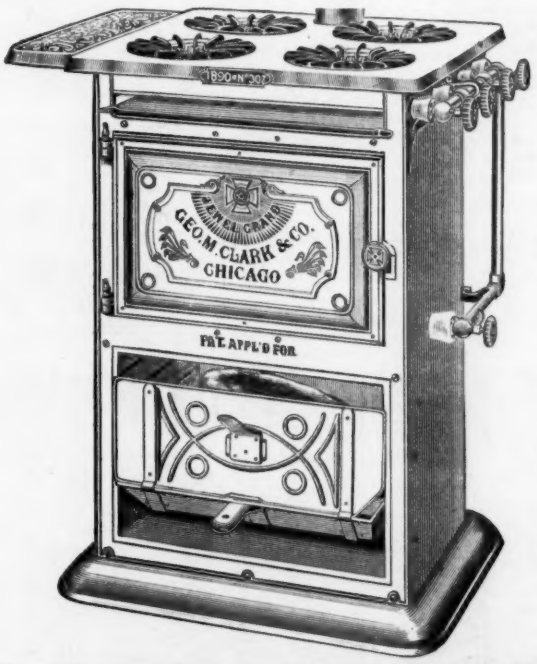

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WELSBACH SYSTEM

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Incandescent Gas Lighting.

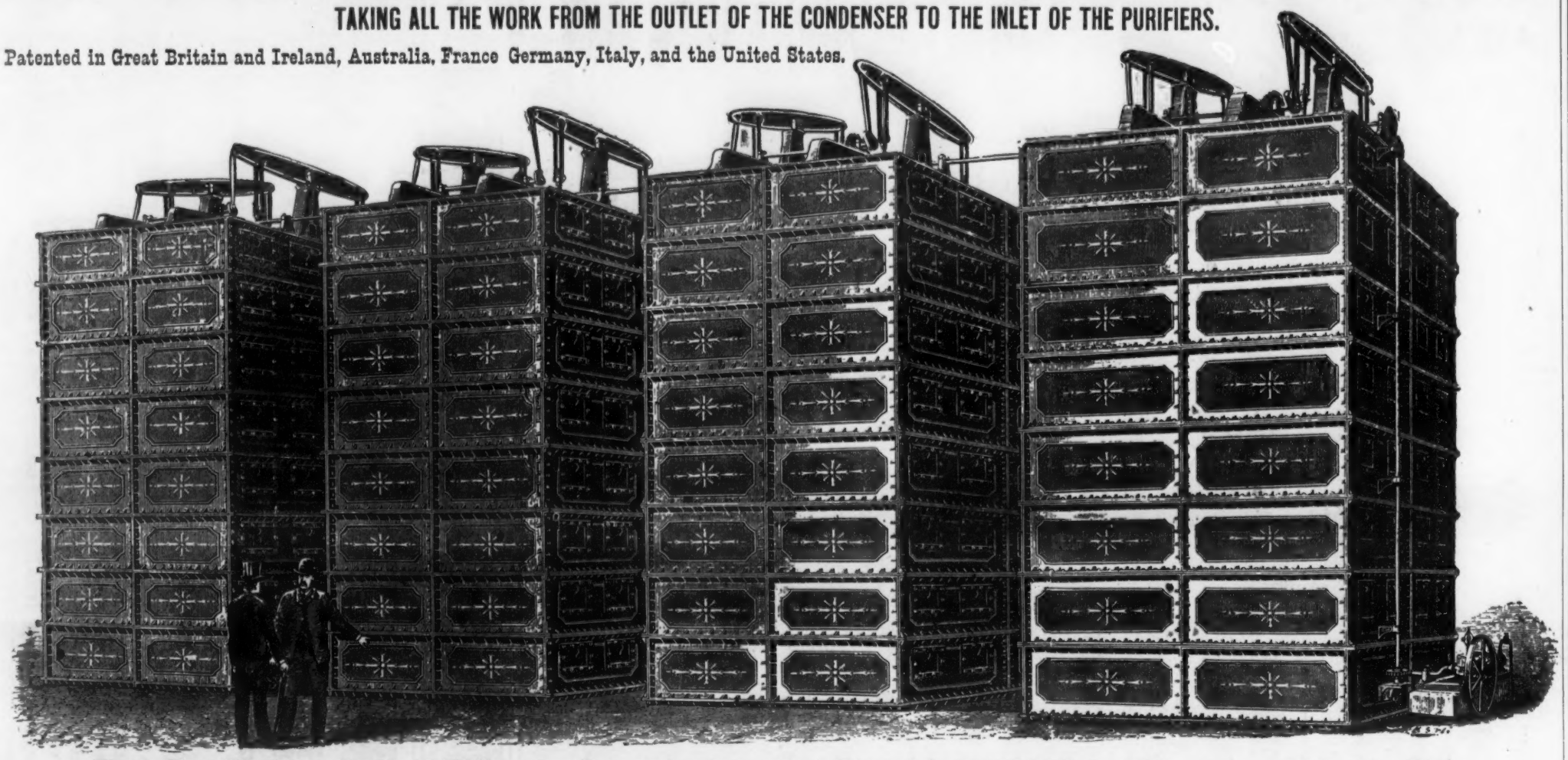
OFFICE, DREXEL BUILDING, PHILA., PA.

At the Fall Session of the Board of Supervisors of Winnebago County. held at the County Court House, Oshkosh, Wis., Nov. 26, 1889, the report submitted by Mr. C. W. Cook, Chairman of the Committee on Public Buildings, recommending the use of the Welsbach Incandescent Gas Burner in the Buildings under their charge, was unanimously adopted, because of the extreme economy in the consumption of Gas and the superior character of the light obtained.

C. & W. WALKER'S PAT. PURIFYING MACHINE.

TAKING ALL THE WORK FROM THE OUTLET OF THE CONDENSER TO THE INLET OF THE PURIFIERS.

Patented in Great Britain and Ireland, Australia, France Germany, Italy, and the United States.



These Four Machines Purify 12 Millions per Day, and only occupy a Ground Space of 60 ft. by 12 ft., and are 23 ft. 6 in. High.

Four of these powerful Machines for the new extensions at the Beckton Gas Works, London, are now working, purifying Twelve Million Cubic Feet of Gas per day, each Machine taking Three Millions per day.

These Machines can be seen at Beckton, where, after being long and abundantly tried, tested, and proved in every variety of working, have been accepted by the Gas Light and Coke Company, of London, as superior to all other apparatus for taking all the work of the purification of gas between the Condensers and the Purifiers.

The Machine is the most important improvement effected in gas works for years past. The purifying power developed is most remarkable. We send an Engineer with a working model to any Gas Company inviting information. It is equally adapted to gas works of any size.

DESCRIPTION.

The gas enters into the washing chamber at the lowermost part, where it is first subjected to a thorough washing in the strong Ammoniacal Liquor. The washing is most effective. The entire surface of the Ammoniacal Liquor is in a bubbling state of ebullition, presenting an agitated, frothy surface all over. All the Tar left in the gas after surface condensation is here completely extracted, and a large amount of Carbonic Acid.

The gas, thus so far purified, ascends from the washing chamber and passes from one superposed chamber to another in contact with the enormous amount of movable, constantly dipping wetted surfaces, leaving the uppermost chamber entirely purified from Ammonia, meeting the chemical requirements of the Board of Trade.

The Machine is self-cleansing, and can never choke or stop up; and in this important respect it is superior to all Machines heretofore known. The space occupied by the Machine is very small. In most cases it can be placed in the space inside the end of the Purifying House. Its cost is less than any other known apparatus for purifying gas from Tar and Ammonia.

These Machines are at work and in hand for Widnes, Burnley, and Oswaldtwistle, in Lancashire; at Harrogate and Wakefield, in Yorkshire; at Stalybridge, in Cheshire; at Stone, in Staffordshire; also at Cheltenham and Northampton, also at Melbourne, in Australia.

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TRUSTEES AND AGENTS FOR THE
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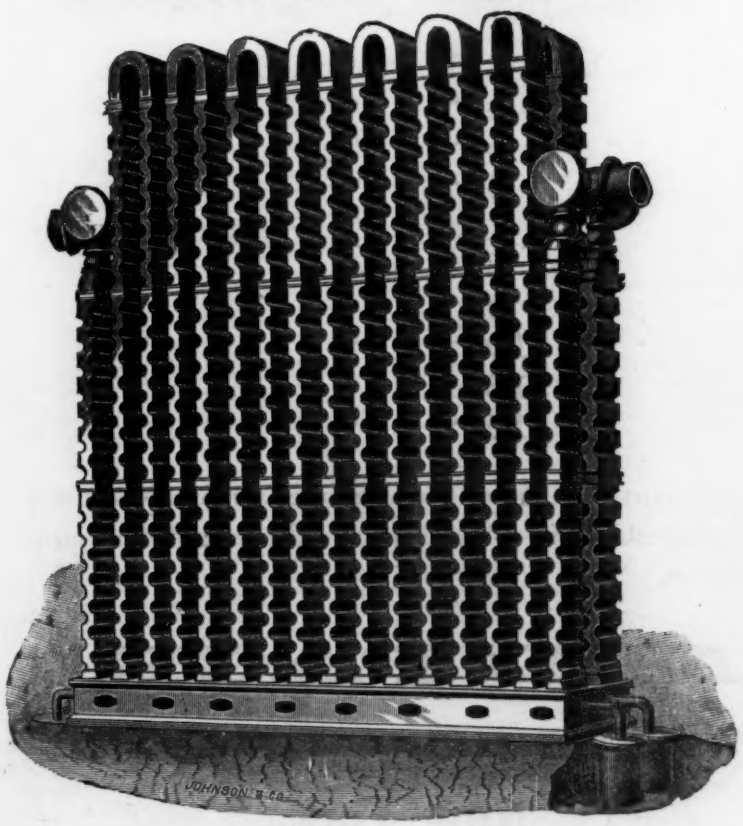

We desire to draw the attention of the gas community to the merits of the SINUOUS FRICTION CONDENSER. Companies intending to introduce new condensers into their works will do well to confer with us and examine plans and estimates before contracting for any other pattern The FRICTION CONDENSER is now in use at the gas works located in the following places:

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Newport, R. I.	Chelsea, Mass.	Jamaica Plain, Mass.	St. John, N. B.
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THE

WALKER TAR AND CARBONIC ACID EXTRACTOR.

A very general demand exists, in both large and small Gas Works, for an apparatus that will be absolutely efficient in the removal of the tar which passes the hydraulic main and condenser. Many attempts have been made to accomplish this, but, I believe, without success, until the introduction, five years ago, in England, of the C. & W. Walker Patent Tar and Carbonic Acid Extractor. During these years this apparatus has been adopted by many of the most prominent Engineers, not only in England, but also on the Continent of Europe and in other parts of the world. It is only necessary to give here a partial list in order to convince any intelligent American Gas Engineer that this machine must have succeeded fully in accomplishing the desired results.

The following Engineers have personally given permission to refer to them:

G. C. Trewby, Esq., Engineer-in-Chief of the Gas Light and Coke Co., London. The manufacturing plant at Beckton is built in complete sections of 3,000,000 cubic feet capacity each. A Walker Tar Extractor has been fitted to each one of these sections. This was done after a long and thorough trial on one of its sections. The Tar Extractor has been supplied to other works of the Gas Light and Coke Co., including those of which John Methven, Engineer of the Gas Light and Coke Co. at the Nine Elms Station, is in charge. Also to G. E. Stevenson, Peterborough Gas Works; B. Green, Mitcham and Wimbledon Gas Works; W. H. Smith, Bedford Gas Works; F. Linging, Norwich Gas Works; J. T. Browning, Colchester Gas Works; S. B. Darwin, Portsmouth Gas Works; J. McCrae, Dundee Gas Works; W. J. Wells, Stamford Gas Works; J. M. Darwin, Longton Gas Works; J. Paterson, Warrington Gas Works; and J. Coulter, of the Dundalk Gas Works. All of the foregoing gas works are located in Great Britain.

Mr. Charles A. Gerdenier, Superintendent of the Bridgeport (Conn.) Gas Light Company, writes as follows, under date of Dec. 3, 1887:

"The C. & W. Walker Tar and Carbonic Acid Extractor has been in operation at these works for the past six weeks, and is an unqualified success. It removes every particle of Tar from the gas in once passing through the apparatus and a large percentage of the Carbonic Acid. I also feel quite sure that it prevents the formation and deposit of Naphthaline, because since I started the Washer I have had no stoppages from this cause. These works have been seriously troubled with Tar for many years, and I have used several kinds of apparatus and every expedient which has come to my attention for dealing with the difficulty, but without success. The Walker apparatus occupies comparatively small space, is less expensive than other systems, and requires but little attention. I carry 2½-inch seal, and have an automatic tar delivery valve. This Tar Extractor is indispensable to gas makers."

I have taken the Agency for the United States for this apparatus, and am now prepared to make contracts to erect it on the premises of any Gas Company. It would be manufactured in the following sizes:

No. 1,	50,000	to	100,000	cu.	ft.	per	24 hrs.,	3	ft.	square,	5	ft. deep.
No. 2,	"	"	125,000	"	"	"		4	"	"	"	"
No. 3,	"	"	250,000	"	"	"		5	"	"	"	"
No. 4,	"	"	500,000	"	"	"		6	"	"	"	"
No. 5,	"	"	750,000	"	"	"		7	"	"	"	"
No. 6,	"	"	1,000,000	"	"	"		8	"	"	"	"
No. 7,	"	"	1,250,000	"	"	"		9	"	"	"	"
No. 8,	"	"	1,500,000	"	"	"		10	"	"	"	"
No. 9,	"	"	2,000,000	"	"	"		12	"	"	"	"
No. 10,	"	"	3,000,000	"	"	"		15	"	"	"	"

This Tar Extractor will perform its work with about one-fourth the usual back-pressure heretofore required. It is simple in construction, and can be supplied at a very reasonable price—less than any other ever before introduced. Satisfactory results will be guaranteed in every instance.

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Chippewa Falls Gas Lt. Co.	Chippewa Falls, Wis.
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Morris Gas Co.	Morris, Ill.
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San Diego Gas Fuel & Electric Lt. Co.	San Diego, Cal.
Sioux Falls Gas Co.	Sioux Falls, Dak.
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San Francisco Gas Lt. Co.	San Francisco, Cal.
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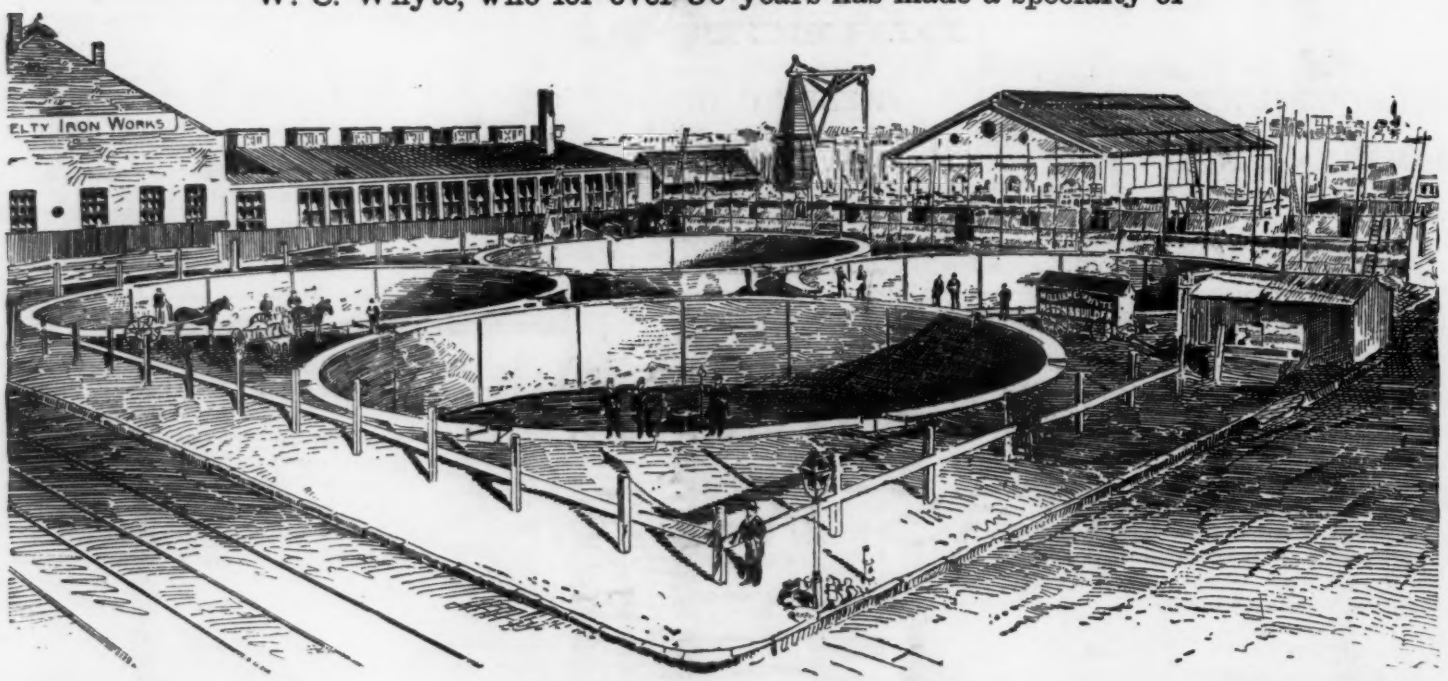

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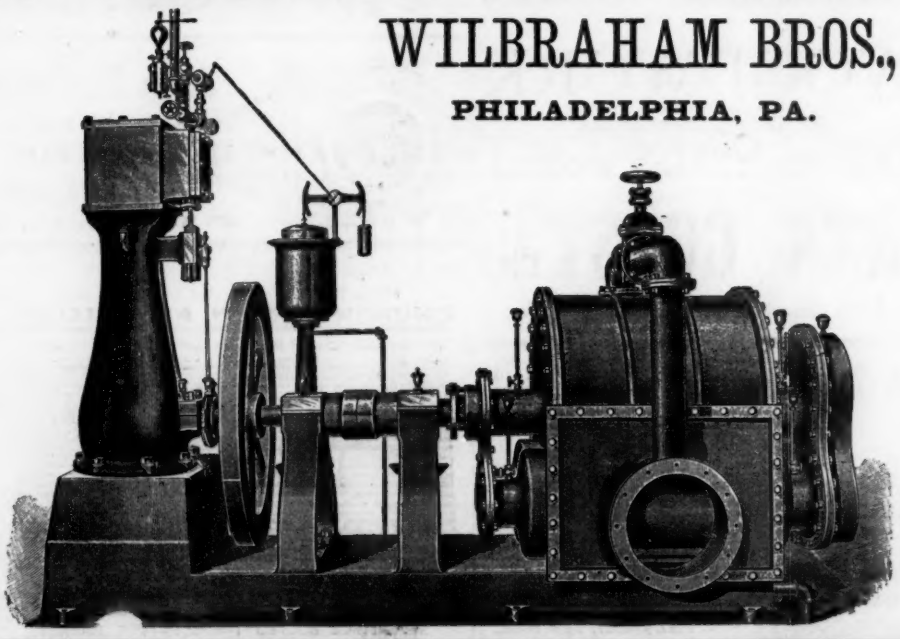

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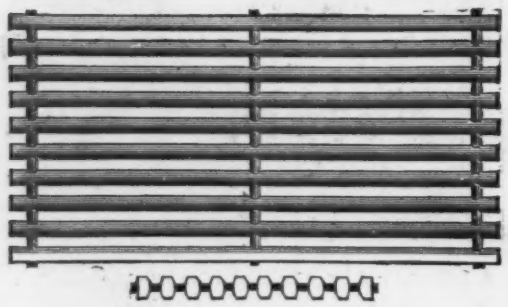

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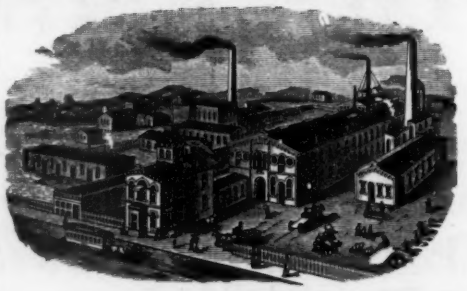

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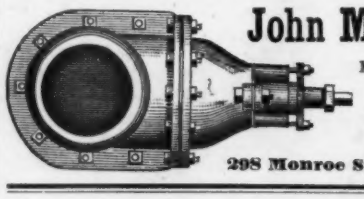

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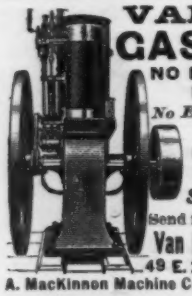

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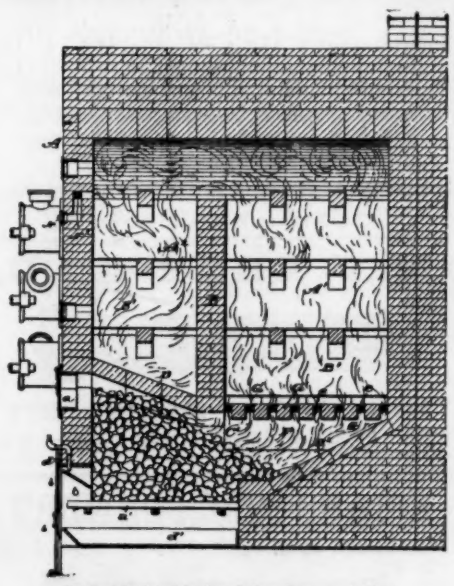

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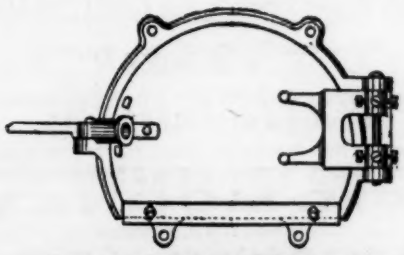

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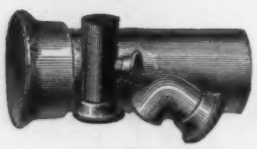

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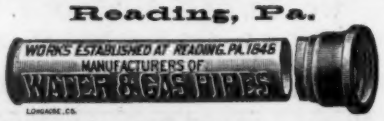

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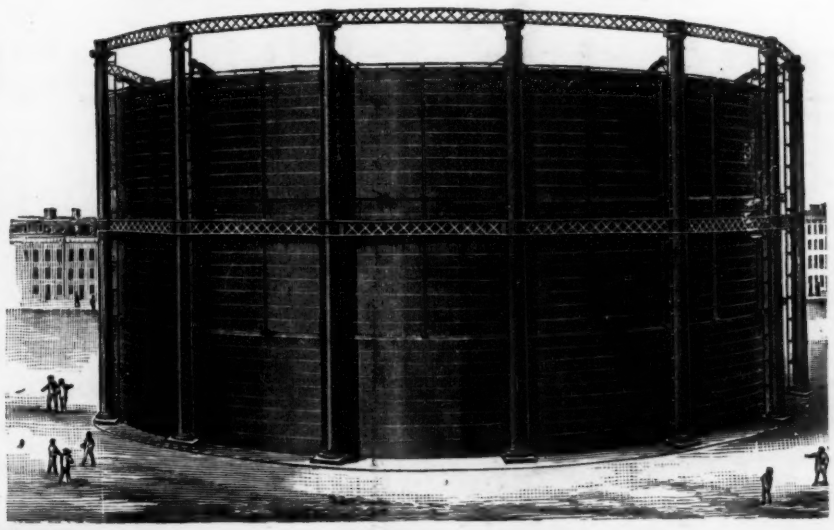

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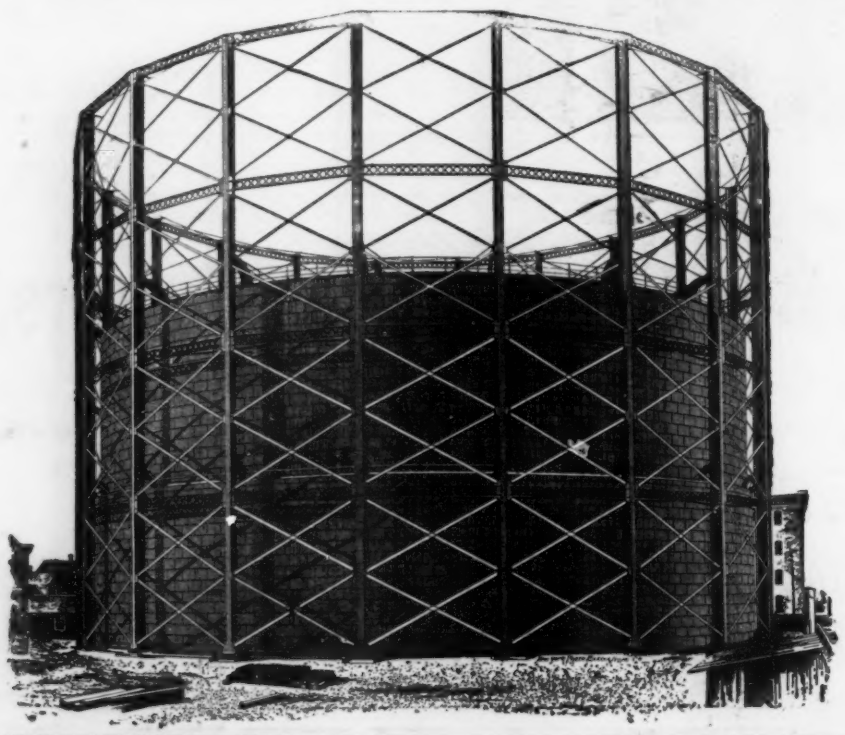

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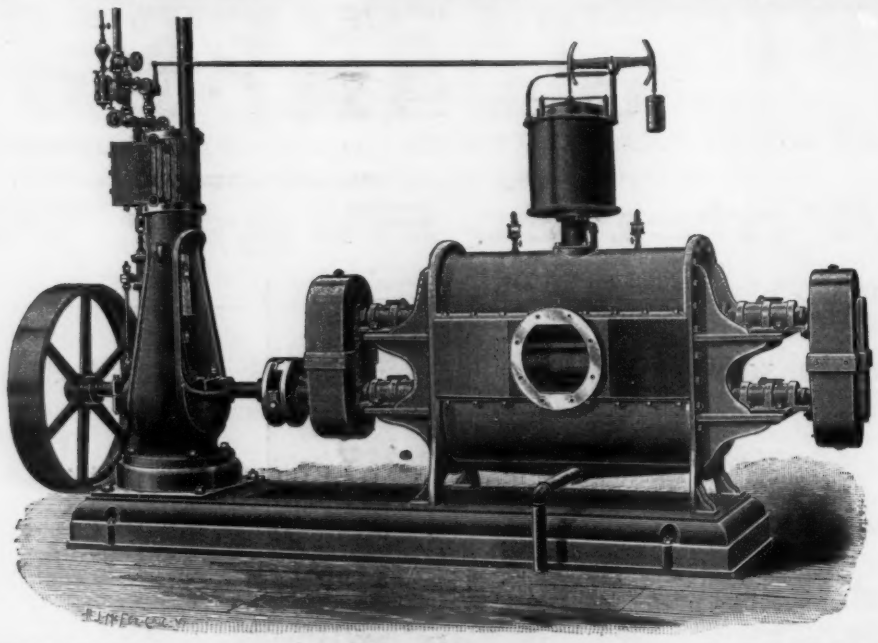

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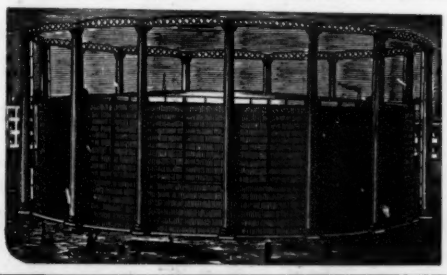

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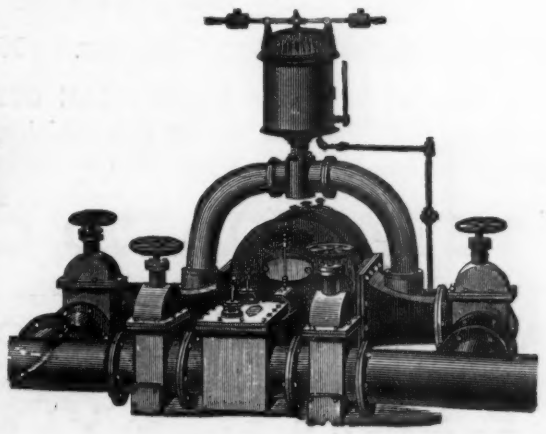

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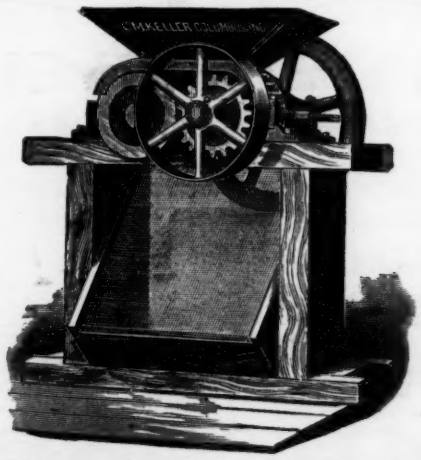

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20 in. wide.	17½ in. wide.	18 in. wide.	21 in. wide.	
	12 in. deep.	13 in. deep.		

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All Fittings are Nickel-Plated.

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17 in. wide.	14½ in. wide.	15 in. wide.	16 in. wide.	
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